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EDITORIAL NOTES.

Labour, and Gas and Coke Trading.

THE President for the year of the North of England Gas Managers' Association is Mr. Thomas Waddom, the long-time and the highly-honoured Secretary of the Newcastle and Gateshead Gas Company. Mr. Waddom stands for much in the large northern Company, for the devising of whose commercial policy, it is notorious, he has been largely responsible; and a grand thing for the Company has been that, with changed conditions, their monitor has shown flexibility in adaptation. The robustness of his views has been more than once seen through the entrance into the public life of the industry that the newer organizations have permitted. At one time, one heard of, but rarely saw, some of the men who were behind the scenes doing important work for the industry. They were hidden away simply because they had not by right, by courtesy, or by good fortune, had bestowed on them the title of "engineers" or "managers." Change, however, has been effected in this respect in the life of the industry chiefly through the organizations that are now devoted to developing the commercial opportunities of the industry. But the North of England Gas Managers' Association have, and alone among our technical bodies, for many years shown by their elections that their presidential chair is not reserved exclusively for gas engineers and managers. They have had Presidents from allied industries; and they have bestowed the honour of the chair upon secretaries of gas undertakings. Among officials generally whatever their designation, Mr. Waddom stands prominently as a champion of the industry's interests; and he is not therefore out of place as President of any gas managers' organization.

In his address on Saturday, the President spoke of the war. We cannot get away from it. It is before us wherever we go; it is practically *the* one topic of conversation; and its effects and responsibilities are upon every individual. But though it has supremacy in our minds over everything else, the country cannot afford that the people at home shall be the least negligent of ordinary interests. Industries, men, and women have their parts to perform; and the better the performance, the better will it be for the common good of the country in these severe and critical times. It is on this ground that the gas industry in its current discussions considers from all points of view what can be done in order to lighten the war's effects. The labour trouble is the one that Mr. Waddom regards as predominant; and he supports his opinion in this matter by quoting figures as to employment by the Newcastle Gas Company during recent years, and as to their maximum requirement in winter. It is to the ability to comply with the maximum need for labour to which the President looks forward with some misgiving. In the recruiting of men, he therefore trusts that the Government will, in whatever measure they take to obtain men for the vigorous prosecution of the war, recognize the essential character of the gas industry—"essential" in several ways not only to the community, but in connection with the war. Recruiting has hitherto been prosecuted on unsystematic lines, and without discrimination. This could not be avoided; but the time has arrived when both system and discrimination can be introduced. One of the Committees advising the Government under the National Registration Act is to make special inquiry into the question of industrial exemptions in relation to enlistment for both the forces and munitions work, so that it is hoped the gas industry will be saved much further trouble. Here we hinge upon a point of policy for the war period. Though they had not got to the maximum requirement for men in the year's gas business, yet away at Midsummer the Directors of the Newcastle Gas Company came to the conclusion that the only section of their operations in which they could make any material reduction of labour was the Distribution Department, by curtailing the supply of new appliances other than those necessary for the requirements of the war. This was rather a drastic measure; but the Directors of the Company and their advisers know their business much better than outsiders. At the same time, our feeling is that such a course is one that should only be taken as a very last resort. For a progressive Company such as that at Newcastle, which has been to the forefront in developing gas applications, and whose system in this regard is a model one, such a decisive break in the continuity of business development is one to be deplored if really necessary, and more to be deplored if made while not altogether necessary. The President says he is pleased to say the public have most patriotically co-operated with the Company in postponing the fixing of gas appliances. But is it only postponement? Will the loss of business from new domestic appliances which might have been, but are not to be, fixed during the war be compensated quickly when there is a resumption of business in new connections. It is difficult to say; but picking-up as a rule is not so quickly accomplished as letting-down.

However, as the President shows, the Newcastle Company have done remarkably well in developing new business up to the time they dammed further accretion in the domestic line. Since 1909, the addition to the gas-cookers on hire has been 11,217, grillers 4150, and gas-fires 9499. This is remarkably good showing; but Newcastle offers an enormous field for further extension in heating business, notwithstanding the proximity to the coalfields. In fact, this proximity enforces the necessity for systematic and continuous procedure in development. Nothing better in the way of methodical working could have been adopted than to partition the supply area into four, with a district representative over each to conserve and develop business, and responsible to a competent chief of the Sales Department. While development in domestic conditions has been stopped, there is the conservation of present business and the development of the industrial load to keep the outdoor staffs going. The industrial part of the Company's business is, of course, a most important one, and the figures cited by Mr. Waddom accentuate this. A short time ago it was calculated that (exclusive of lighting in factories) the Company were selling annually some 750 million cubic feet of gas for industrial heating and power purposes, which figure (it is exceeded at the present time) represents nearly one-fourth of the total consumption.

Much was said in the address about the results that accrue to the industry from co-operative work and policy in commercial matters. The good that was done in connection with the coal question by united effort was also touched upon. Having got to a standard figure which the coalowners may charge above the 1914 contract pithead prices, Mr. Waddom thinks that we must look to the price so calculated for the period of the war, unless the operations of the Coal Export Regulation Committee succeed in bringing down the price to which the 4s. is to be added. The Act does not prohibit a change in price within the boundary line of the prescribed figure. But we do not think there is much hope of the colliery owners allowing anything to stand in the way of getting their full pound of flesh. It would be against all modern precedent of their own creating if they missed their opportunity. Speaking of the Coal Exports Committee, they also deal with coke and other fuel. The Newcastle Company have been for years developing a large overseas coke trade, and they have relieved the gas industry in the North of England by what they have done in this regard. In the last two years, 74 and 68·8 per cent. of the Company's coke production has been exported; and these percentages represent big total figures. Now if this coke export business is curtailed (and the Newcastle undertaking is only one out of several which export coke to the Continent) serious injury would be done to both the country and the gas industry, while freedom of coke exports to neutral countries would not do any good to our enemies. It is not our coke that Germany requires. It

is our coal, and the products to be derived therefrom. So that it is hoped the Coal Exports Committee will look with a benevolent eye on coke. We do not think there need be any fear that the coke that remains with the coal production will not meet home requirements for fuel. There is a difference in coal stocks now compared with last winter. Speaking further of the primary residual, the President foresees a large development in its production through extended gas consumption, lower fuel accounts in manufacture, and, when oil is dear, the letting-down of carburetted water-gas plants. It behoves gas men, therefore, to exercise themselves in developing their local coke markets. What is being done in this regard in Newcastle, together with the results, is told in the address. An important factor in coke sales development is rapid delivery. This is being more and more recognized by gas undertakings. The horse and van constitute, according to our modern ideas, a cumbrous, slow-moving method. The Newcastle Company have a "fleet" of twelve motor waggons solely for coke transport. These extend the field for home sales; and rapidity gives to each waggon a large daily delivery capacity.

The address is just such a one as would be expected from Mr. Waddom—practical to the extreme, and full of sound directive wisdom.

Of Current and Future Concern.

THE members of the Wales and Monmouthshire Institution did a right thing in not allowing the translation of Mr. A. W. Branson, from the Engineership of the Rhymney and Aber Valleys Gas and Water Company, to that of the West Hartlepool Company, to interfere with the tenancy by him of the presidential chair. If through the results of bombardment and various other pressing duties, he has not been able to give all the local attention that is expected from a President of a District Association, the address which he delivered to the members last Wednesday is one of those productions which amply make amends for any unavoidable presidential shortcomings. Mr. Branson surveyed the exceptional conditions arising from the war, in so far as they bear directly upon the gas industry. Every exceptional condition has its incidence in some form or other; but no President, in an address of this nature, can do more than deal with the conditions that have salient effects. Within the permissible limits, the President made excellent review—excellent in both its clearness and the philosophic reasoning for giving to the current conditions the broadest significance. There is greater safety in doing this than in the reverse, as the deficient interpretation of portents may land us in deeper quagmire than the industry's affairs are in at the present time through the circumstances of war, and nothing else. It behoves us all to be particularly open-eyed just now—not only in respect of the present, but of the future. In our considerations, the future is as important as is the present, because the future is not going to be exactly as the past. Those who to-day try to measure post-war conditions with the rule supplied by pre-war conditions, and accept the result, will indubitably find themselves in a grievous mess. We know fairly well where we stand at the moment; we know where we are for the time in regard to coal prices; we have fairly sound ground from which to make prospective count of residuals values—during the war, but not afterwards. It is now a question of looking forward.

There is a good deal of looking-forward in Mr. Branson's address. There is the immediately coming winter. He warns against deferring till Nov. 1 getting-in stocks, in order to obtain reduced prices under the Coal Prices (Limitation) Act—that is to say, in the case of those who made their contracts during the period covered by the retrospective clause in the Act, at beyond the 4s. standard increase upon the pithead prices of the preceding year. Caution has come from high quarters against procrastination in the accumulation of stocks until the period when the demand will strain the output resources of the collieries, and possibly the capacity of the means of transport, which latter are beginning to feel the effects of the increased output and the transference of munitions. The necessities of gas undertakings that made high priced contracts during the period in question are, under the Act, a decided advantage to the colliery owners. This matter bears upon that of permanent increased provision for storage. This provision represents money; but it cannot be helped. The disparity in deliveries between winter and summer, the President urges, must be minimized in future as much as possible. This is wise. Those who are not troubling now about good stocks are menaced with a repetition of their trials of last winter and early spring. This may not prove so; but the menace bids fair to materialize. And after the war? Only the other day, it was seen that the scheme for a militant alliance between the miners, the railway, and the transport workers of the country is only being held in abeyance until the termination of war. Such a union is not a happy one for the peace of mind of the community at large.

The Coal Prices (Limitation) Act does not "establish the "principle" of coal price limitation; it is only a temporary instrument for keeping coal prices within defined bounds during, and for a period succeeding, the war, until we settle down again to something like normal conditions. But it is the thin end of the wedge in working for future control of coal prices, or, if not control, the setting-up of machinery whereby appeal can be entered when prices take unwarrantable flights. Mr. Branson thinks it only right (and we agree with him) that statutory concerns which are such large coal consumers as gas undertakings—especially in view of their limitations in respect of price and dividend—should have the power to appeal to some tribunal against "forced prices" for coal. The existence of such a power would undoubtedly be efficacious in moderating the profit-grabbing that has been witnessed on more than this one occasion during late years. Mr. Branson also touched upon the point as to the regulation of coke prices. The question, it may be recollected, was raised in the House of Commons by a coal-owner when regulation of coal prices was under discussion. Retaliation was in the coalowner's mind; but the President of the Board of Trade reminded him of the fact that gas companies are limited in regard to gas prices, dividends, and finance generally, which the coalowners are not. Their positions are not by any means analogous.

In passing, Mr. Branson alluded to the proud position occupied by the gas industry in relation to the response made by its men to the call to arms; but he, too, thinks the time has come when the process of gradually stripping of men such a public service must be discontinued, if the public supply is not to be jeopardized. He is also of opinion that Government badges should now be provided for strictly indispensable men. Foreseen, too, is the compulsorily larger resort, in spite of the higher prices of both oil and coke, to carburetted water gas, owing to the fewness of men required in relation to output. Reflection leads to congratulation that, in these days of pressure for men, conditions are not as the old conditions were. Though the wages bills of gas concerns are larger than ever in normal times, through the increased demand for skilled workers in the distribution and sales departments, yet, owing to the introduction of labour-saving appliances (including carburetted water-gas plants) and higher yields per ton of coal, fewer men per million cubic feet of gas into the holder are required upon works to-day than was the case not many years ago. If there had not been the mechanical and other developments in all the manufacturing department that there have been the last decade or two, and the number of men required per unit of output had not been reduced, we hardly dare to think what would have been the position of the industry during this war.

Still looking to the future, the President sees in the position of the industry in respect of capital and dividends something that should claim the gravest consideration. We have hammered at this matter since October last year; and only last week again treated of the subject in connection with the terribly dwindling returns on some gas stocks, owing to the operation of the sliding-scale and heavy income-tax. All our restricting legislation in regard to finance has reference to normal times; and no one appears to have ever thought until this war of trying to make the rule of legislation subject to exceptional circumstances. In the case of sliding-scale companies, regulated price, dividend, carry-forward, and the means of raising capital, all help in these extreme times, supplemented by heavy taxation of dividends, to depreciate the capital position of the gas industry, and to give an unduly low return upon investments, just when the maintenance of income is very desirable to meet the more onerous needs. The proposal has been mooted in our columns that application should be made to Parliament to allow the temporary suspension of sliding-scale and auction clauses, and greater freedom in the issue of loan and redeemable stock. Though the gas industry has no equivalent in these matters among other industries of the land, the suggestion is met with a *non possumus*, and the question is asked why the gas

industry should have preferential treatment over any other industry. The reply is because other industries are in a preferable position in these times; and so the gas industry should be divested of some of its curtailment, to enable it to secure a nearer equality with those other industries—during exceptional conditions. The difference has illustration in some dividends (less income-tax) and stock market values. Mr. Branson suggests that the matter should be dealt with by a General Bill; but the difficulty is to get people to move jointly in such affairs. Why, we cannot tell, because in this instance it is only a matter of expediency to produce fairness—exercisable temporarily, and not permanently—and therefore there need be no local opposition.

There are several other questions which have been raised by the war, to which the President turns attention. We cannot comment upon them all. There is, however, one referring to the charge for reduced public lighting. This has been a much debated matter. Mr. Branson thinks that, if an allowance is made for the gas unconsumed short of the minimum stipulated in the agreement—such allowance to represent as nearly as possible the actual saving effected by not having to manufacture the gas—then gas undertakings are doing all that should be expected of them, bearing in mind increased costs since the war began. The President does not say whether he intends that the basis of deduction should be the cost of manufacture to-day, or the cost prior to the war. If the current cost is taken, it seems to us the local authority would be getting an undue advantage owing solely to the war. We are glad to find the President such a progressive that he believes in not allowing business development to be stayed by the war within the limits of ability to prosecute the work, more especially seeing that fresh business is required to compensate for lost consumption. There is full agreement, too, with him that insurance against bombardment and air-craft damage should be a national burden, as being incidental to the war, not a burden on people who unfortunately for them are situated geographically in the most pregnable positions.

Stepping aside from the war, Mr. Branson's experiences in main-laying in a mining area will be found extremely interesting, together with his advocacy of steel mains and lead wool joints. With regard to the point as to the reason that the lead wool joint is more stable than the run lead joint, Mr. Walter Hole touched upon this in his American Institute paper [see last week's issue]. He said that experiments had convinced him that the lead wool joint is of much greater strength than run lead; but this is not due to the greater density of the lead wool packing. Experiments have shown that the shrinkage of the lead ring towards the centre is one of the reasons for the essential inferiority of the run lead ring as a jointing material. Mr. Branson's address takes us over much ground, but in a concise way; and there is interest in every part.

Calorific Value and Standard.

If any case were required in defence of the substitution of a calorific value standard for the illuminating power one, as well as of the general lines and terms of the model calorific clause, it would be found in the useful little paper that Mr. J. T. Dunn, D.Sc., read at the meeting of the North of England Gas Managers' Association on Saturday. It cannot be said that the paper presents anything new on the subject (the author himself confessed as much); but its usefulness is found in the concise form in which are given the pertinent considerations affecting the matter, upon which even some men who profess technical knowledge of it have but hazy notions. Politely but effectively Mr. Dunn deals with those who entertain the old, superficially based belief that calorific value has some definite relationship with, or proportion to, illuminating power. The latter is no direct measure of the heating or energy value of gas; for the small proportion of heat that is given off by the burning gas does not by any means represent the total heat energy of the gas. This elementary fact is too often overlooked. But we think that accumulating information, and published data, will gradually extirpate the mistaken idea, from parting with which there has been a good deal of reticence shown by certain excellent engineers, but manifestly bad chemists and physicists. Only recently tests have shown that if gas were practically denuded of its benzol, illuminating value would fall to an amount unworthy the description, while the calorific value would only be influenced by a comparatively insignificant percentage. The conclusion of Mr. Dunn is that the retention of such a purely formal requirement as illuminating power may seriously hamper gas undertakings in securing economic advantages in the process of gas manufacture. Discussing the Junkers and Boys calorimeters, he finds the latter the more convenient, and in ordinary daily work more accurate. Had Mr. Dunn been reading his paper before a meeting representing a body of gas consumers, it might by gas engineers have been regarded as an unkind thing to have "let the cat out of the bag" as to the influence of variations of barometrical pressure and of temperature upon the number of heat units delivered, per measured 1000 cubic feet, to the consumers through the differences in the volume of the gas. But on balance there is nothing much in the point. The instability of computations of net calorific values is again shown; and the case is made out for gross or total value in accordance with the model clause. There has been on various occasions discussion regarding the relative advantage and disadvantage of a gas of high and of moderate calorific value; and Mr. Dunn, like others in this country, but not consistently so in America, shows that advantage to the consumer, and to constancy and economy in manufacture, lies on the side of a gas of reasonably moderate value. There is no desire just now to enter into any controversy as to whether or not the metric system should supplement the established weights and measures in this country; but we are glad to find that the author supports the protest we made some time ago when, in certain calorific clauses, a hybrid terminology was adopted, and which protest, we are pleased to know, had weight with Mr. Charles Hunt, the Chairman of the South Suburban Gas Company, and led to all-British terminology in the calorific clause in the Company's Act of 1912. That clause really supplied the foundation for the one in the Gas Light and Coke Company's Act last year, and which revised form now (somewhat shortened) serves as the "model."

Colliery Owners and the Price Limitation Act.

Gas undertakings are having varied experience with colliery owners as to the construction of certain clauses in the Price of Coal (Limitation) Act. Some of the owners are trying to carry out the Act in the spirit and to the letter. Others are exercising the arts of evasion and finesse, in the attempt to get the better of those with whom they have contract business. Those who are doing this should be earmarked, and, through the private channels of communication which the Commercial Sections of the gas industry afford, promulgation should be made of their names. The last thing the gas industry desires to do, in present circumstances, is to quarrel with any of the colliery owners. All that the industry asks for is fair dealing. But the fact is, we learn from various parts of the country, that some colliery proprietors are contending that, under the new Act, the proper basis price is not the contract price for the year to June, 1914, but a day-to-day price. If such an interpretation were the true one, then the Act would be rendered practically nugatory, and the colliery owners so contending know this; for the necessary labour and investigation, and the certain dispute, would be so intolerable, and the beneficial result so limited by price variation up and down, that the primary objects of the Act—relief and control—would be almost completely extinguished. The submission of gas undertakings is, of course, that the price or prices paid under the corresponding contract for the year to June, 1914, is the correct basis. To heap up difficulty, and to make the Act as inoperative as possible, there are also colliery owners who assert that the 50 per cent. increase on waggon hire is chargeable on contracts entered into before the passing of the Act. This increase on waggon hire, certain colliery owners appear to regard as a helpful weapon with which to meet purchasers of coal who seek relief from new contract coal prices which exceed the terms of the Act.

Under these circumstances, the thanks of the gas industry are due to the Lancashire Commercial Section of the Manchester Institution of Gas Engineers for having obtained from the Board of Trade expressions of opinion as to the proper interpretation to be given to the clauses of the Act bearing upon these two points, and to the Board of Trade for permitting the publication of the opinions, which are given without prejudice to the view they might take under any special circumstances that might be referred to them by a Court of Law. The opinions are set out in two communications signed by Mr. W. F. Marwood, on behalf of the Board, and which communications are forwarded to us for

publication [see "Correspondence" columns to-day] by Mr. S. Meunier, the Chairman of the Lancashire Section, and Mr. S. E. Halliwell, the Hon. Secretary. The opinions support the contentions of those responsible for the conduct of gas undertakings. "The corresponding price after the 29th of "October," Mr. Marwood says, "will not be the price of "coal sold otherwise than under contract, but will be the "price of coal sold under a contract corresponding to that "under which the deliveries are being made." Then as to waggon hire, Mr. Marwood states that, while the Board are not in a position to decide the legal question whether the giving of notice under section 4 (2) of the Act enables contractors to make increased charges for waggon hire, "they "are of opinion that the giving of such notice would not "appear to affect any terms of contract *other than the price "of coal at the pits' mouth.*" These are the only intelligent constructions that could be placed upon the clauses in question; and we have little fear that neither before nor after the pronouncement of the Board of Trade, any colliery owner would have been or is prepared to take up in a Court of Law the defence of the position assumed by them or on their behalf. The decisions are valuable. In view of them, we hope much trouble will be averted. The Act having had its origin with the Board of Trade, the interpretation by the Board may be taken to represent the intention of the originators; and being called upon to construe, under ordinary contractual conditions, the meaning of the Act, a Court of Law would give heed to these stated intentions. It is to the interests of all concerned that the rebates to be made where they can be claimed under the terms laid down in the Act, should be settled as early as possible; and the publication of the correspondence with the Board of Trade should facilitate this being done.

Raids and Light Screening and Economy.

THIS coming winter will see further considerable reduction of consumption of gas and electricity for lighting purposes in the Metropolitan and certain other areas. Happy will be the gas undertakings in and about the Metropolis with a good heating, cooking, and industrial load; unhappy will be those electricity concerns with little more than a lighting load on their cables. The Home Secretary has issued a new order relating to lighting, not only in streets and open spaces, and inside and outside shops, but to domestic dwellings throughout the London Police District; and what is ordered for the Metropolis will undoubtedly be an exemplar for other localities more or less exposed to attentions by aërial raiders. The last Zeppelin raid on London will have prepared the citizens for a more stringent order; and what then happened will be the best possible inducement to ready compliance with the order, which is reproduced in its essential parts in our news columns to-day.

The first attempts made in London to obscure the streets from the inquisitive eyes of those running through trackless space above were not altogether satisfactory. They may have partially served their purpose; but the attempts and the effects looked painfully crude. High-power lamps in the streets had their globes painted at the top, with the result that the light from the lamps was not distributed; but huge circles of concentrated light were thrown on to the roadway below. We do not know what better indication than the occurrence of these equi-distant circles of light could have been given to nocturnal aviators that they were over a main street which, under ordinary conditions, was favoured with high-power lights. But this state of things is now altered; and a main street is given no more prominence than a side street so far as street lighting is concerned. Respecting shop lighting, considerable inconvenience is caused to shopkeepers in the matter of screening their inside lights; and it would do no one much harm, compared with present conditions, if, instead of putting tradesmen to all the trouble of keeping unlit or screening lamps, the fiat went forth that shops were to be closed at prescribed times during certain months. It is only because one shopkeeper will persist in keeping open after (say) seven o'clock that others in the same line of business are compelled to do likewise. If people, too, were informed that they could only shop in daylight hours as long as the war continued, they would soon get used to doing so, and arrange accordingly. It is because there is no compulsion that the tradesmen have to keep their shops open, and their assistants in attendance. We know day-by-day early closing is against the interests of gas consumption. But the interests of the country and of life have priority; and business in shop lighting has now got down to such lean dimensions, and will be leaner still in a short time, that little injury would be done to the gas and electric lighting businesses by the authorities going a step farther and compelling closing at specified hours in certain months so long as the war lasts.

An important step has been taken in including in the order referring to the Metropolitan Police District private dwelling-houses and other premises; and not only in respect of windows and glass-panelled doors facing the street but of back ones. It has in some residential areas been absurd to see the street-lamps with partly or wholly painted panes or globes, and the houses flanking the same streets with an unbroken run of lights showing brightly through diaphanous "blinds." This has been witnessed on both sides of streets and on upper and lower floors. All this is to be altered now, at both the fronts and backs of dwelling-houses and other premises. Everyone owes it to his or her neighbours, to the community generally, and to himself or herself, to see that the rules are complied with. Admittedly, there are difficulties; and no doubt recourse will be had to all sorts of crude devices for subduing the external indications of the presence of lights inside. Of course, the first thing will be to keep lights extinguished in all rooms not in use. The next thing must be to ensure, by heavy secondary curtains, or linings of some sort to the blinds, a less visibility of light. An alternative will be by screening lamps, and throwing the light downwards. There is room here, and an opportunity for the gas companies involved to show their interest, by sending round to householders a circular explaining to them how best to meet official requirements, and to do their part as citizens in this matter of helping to defeat one of the aims of the enemy. The enemy says that he looks for dark places in making raids; he would sooner have light places showing him something he may consider specially worthy of attention. If all places are kept dark, then he will not have the guidance of alternations of light and dark; and this will help to frustrate the success of his destructive mission.

The Old and the New.

The members of the North of England Gas Managers' Association visited Newcastle last Saturday, and had an excellent time in and about the Elswick Gas-Works, where the Engineer (Mr. T. Hardie) had much of very exceptional interest to show them. It is a works the equipment of which has been brought right up to date. There are large installations here of the Glover-West vertical retort system (which has displaced horizontal work); mechanical handling of material is the practice, including the telpher system; in the fine power house are seen three large gas-driven electricity-generating sets; and gas-compressors are in use. Everything, in fact, is as complete as engineering skill, ingenuity, and foresight could make it. In the description of the works (published in other columns), some comparative figures appear which show how the supplanting of old conditions has promoted economical working—the ground space required is less; the yield of gas and coke is more per ton of coal carbonized; a slight fraction less of tar is made per ton, but is compensated for by an increase of 0·79 lb. of sulphate of ammonia per ton of coal; and carbonizing wages are down to less than 25 per cent. of what they formerly were per 1000 cubic feet—viz., 4·91d. under the old system, as compared with 1·029d. under the new. Only a portion of the second installation of verticals has yet been put into operation; but the results promise to be even better than those shown in the tabular statement. The sulphate of ammonia produced per ton of coal is rather on the low side—19·79 lbs.; but perhaps there is some good explanation of this.

Silence and Reward in Dublin.

There is evidently no intention on the part of the Board of the Alliance and Dublin Consumers' Gas Company to allow the proprietors to see the report of the experts on the conditions of the concern, which were slowly robbing it of vitality and running it deeper into financial muddle. We still hold that the proprietors have a full right to have the report disclosed to them, so that they may judge for themselves to whom to award credit for what has occurred in bringing about the improvement, and from the same information be in the position to extract the causes for the deplorable state into which the concern was allowed to sink. There was absolute silence regarding the report at the meeting

of the proprietors on Thursday last; but the attendance of shareholders was very small. At this small meeting, the resolution was passed awarding the three new English Directors an extra tangible recognition of their services to the tune of £1000, and allowing them to be specially interested in the division of a further £500 per annum voted as Directors' fees. Mr. Roche, who moved the necessary resolution, gave to the Directors from England credit for having "placed the concern in a position which the proprietors had not looked to see it in in so short a time." Are they the only ones who have worked to that end? If so, then the quicker the other Directors are ordered by the proprietors to right about face, the better. But Mr. Roche also acknowledged in words the efforts of the officials, including Mr. W. J. Grey (the Secretary), as well as the efficiency with which the work of all departments is now being carried on. The Chairman (Mr. John Murphy) likewise acknowledged—in words—how much is due to the Consulting Engineer (Mr. William Newbigging), whose "efforts in placing the works on their proper basis had been unremitting and, he was glad to say, uniformly successful." He also referred to the "able services" rendered by the Secretary and the Works Manager (Mr. H. Dumbleton) in their respective capacities. The £1000 and the £500 a year ought, it seems to us, to have a wider distribution. Mr. Roche further urged that the duty of the proprietors was to encourage the Board in the enterprising methods which had been adopted. A question that concerns the proprietors is, Who proposed these enterprising methods? And a further inquiry, Was the concern really allowed to run into an unsatisfactory and perilous condition because the proprietors had not previously sufficiently "encouraged," the Board? Ireland must be sadly off for gas directors if it is necessary to cross to England for men to fill such positions who have not been technically trained in gas matters and administration, to pull a Company out of difficulty into which it had been muddled. One indication is given as to the direction from which good has been derived by the Chairman's references to economies effected, through technical advice, in coal handling and other matters. The new Directors surely did not suggest these economies. Need more be said?

Income-Tax Deductions.

In our "Miscellaneous News" columns to-day, there appears the text of a memorandum, issued by the Board of Inland Revenue, as to the deduction (under the new order of things) of income-tax from interest and dividend payments made after to-day. There would be little use is pointing to the main features of the document; it requires to be studied in detail by secretaries and others who will have to deal with the matter.

Enlistment and Badges.

Among the minutes of the last meeting of the Council of the Institution of Gas Engineers (published in a subsequent column) is one stating that the Manchester District Institution have obtained from the War Office an assurance that skilled employees of gas undertakings are not to be accepted for enlistment unless in possession of a certificate from their employers showing that their services can be spared. The Ministry of Munitions state that the wearing of the official badge will exempt men from enlistment.

Flues, not Chimneys, for Gas-Fires.

The "Builder" has done a service in showing how the gas-fire can assist in modifying building designs and economizing in space and structure. Just recently, the electricians have been endeavouring to make the point that in box-like bed-rooms in flats, there is no need with electric-radiators for chimneys; but the trouble they cannot get over is that the exclusion of a chimney from a bedroom affects ventilation in a very ugly and insanitary way. Not all architects who may happen to prefer electric lighting are prepared to advise the abandonment in bedrooms of a chimney of some kind. But in a "Builder" article [extracts from which are given elsewhere], it is shown that the gas-fire can be of assistance to the architect in diminishing chimney structure for any rooms, and yet maintaining a ventilating shaft, and at the same time securing the aid of a gas-fire in promoting ventilation. A flue of an area of only 36 square inches amply suffices for a gas-fire; and, as no sooty incrustations occur, the chimney area will always be maintained. Besides economy in space and structural work, there is the saving effected by not having to put in coal-grates, which often represent such waste of money in these days when people like the freedom from labour, the convenience, and the heating efficiency of the gas-fire. Some illustrations are given in the article of places that are now innocent of the crude system of heating by coal; and a hospital is mentioned that has shallow flues let in the walls for gas-fires, in order to save space.

PERSONAL.

A proposal has been made for the erection of a memorial tablet in the Municipal Buildings, Blackrock, to Lieut. NESBITT, of the 6th Battalion Dublin Fusiliers, and well-known prior to his enlistment as an official of the Alliance and Dublin Consumers' Gas Company, who was recently killed in action.

The accountantship of the Gas Light and Coke Company—vacant by the death of Mr. Blakey, recently recorded in our pages—has been filled by the appointment of Mr. H. E. IBBS. According to the Company's "Co-Partners' Magazine," he is a son of one of the Company's collectors, now on the pension list. He entered the service as a junior clerk in the year 1899, and became a senior clerk in 1907. This year, on it becoming unfortunately apparent that Mr. Blakey's absence on sick-leave was likely to be prolonged, the Court of Directors appointed Mr. Ibbs as Acting Accountant *pro tem.*

We learn from Mr. Ernest L. Burton, the Secretary of the Brighton and Hove General Gas Company, that the following changes have taken place in the staff of the Company: Mr. JOSEPH CASH, M.Inst.C.E., has retired from the position of Engineer and General Manager of the Company, and has been appointed a member of the Board. Mr. Cash has been identified with the Company for the last fifty-four years. Mr. CHARLES H. RUTTER, M.Inst.C.E., the Assistant-Engineer of the Company, has succeeded Mr. Cash as Engineer and General Manager. Mr. Rutter was first associated with the Company in 1886. To fill the vacancy created by Mr. Rutter's promotion, the Directors have appointed, as Assistant-Engineer, Mr. F. SMALLBONE, who was for many years Engineer and Manager of the Chigwell, Woodford, and Loughton Gas Company.

OBITUARY.

The death of Mr. E. H. MILLARD, the Gas Manager to the Cowes Urban District Council, occurred on Monday last week under circumstances of great suddenness, which are recounted on another page of this issue. Mr. Millard had been for thirteen years in charge of the Cowes gas undertaking, in connection with which he had done much good work. He was 54 years of age, and a native of Middlesbrough. Before going to Cowes, he was Manager of the Hinckley Gas-Works, and for about ten years he managed the Durham Gas-Works. Deceased was a member of a Durham Lodge of Freemasons. He leaves a widow and eight in family—the majority grown up. The funeral took place on Thursday, and was attended by the Chairman (Mr. Douglas Atkey), members, and officials of the Cowes District Council, employees at the gas-works, and a number of local gas managers. Among the floral tokens, was one inscribed "In faithful remembrance of their esteemed Secretary, from all the members of the Isle of Wight Gas Association."

Midland Association of Gas Engineers and Managers.—The autumn meeting of this Association will be held at the Grand Hotel, Birmingham, on Thursday afternoon of next week.

Manchester District Institution of Gas Engineers.—Under the presidency of Mr. J. G. Newbigging, M.Inst.C.E., the 173rd quarterly meeting of the Manchester Institution will be held on Saturday, the 30th inst., at the Grand Hotel, Manchester, after a morning visit to the Bradford Road Gas-Works, to inspect the toluol extraction plant, the chemical-works, and other interesting developments now being carried out at this station. The principal business in the afternoon will be the reading of a paper by Mr. E. V. Chambers (Messrs. Hird, Chambers, and Hammond), on the "Dehydration of Tar," and an informal discussion on toluol extraction. Thereafter, a report from the Scrutineers will give the result of the election of office-bearers for next year.

Coke-Oven Gas Distribution in Germany.—The distribution of coke-oven gas for light and heat was (says "Engineering") introduced in Germany years after it had gained a footing in the United States; but in the former country it had assumed considerable importance by the end of 1913, when about 8 per cent. of the total gas consumed was coke-oven gas. The start was made in Westphalia. The two most important plants are that of the Hamborn Colliery, which sends coke-oven gas by lines about thirty miles long to Barmen and to Wessel, the mains having a diameter of about 20 inches, and that of the Rheinische Elektrizitätswerke, which sends the gas from the Mathias Stinnes collieries to several municipalities through a pipe system 140 km. in length. These two pipe systems are interconnected to meet emergency cases. Fifty municipalities in Westphalia and Rhineland burn coke-oven gas, which is also much used in the Saar district and in Lower Silesia. The price varies (or varied before the war) very considerably; the minimum being 1·5 pf. per cubic metre—5d. per 1000 cubic feet.

INSTITUTION OF GAS ENGINEERS.

War Office and Recruiting—Scientific and Industrial Research.

A Meeting of the Council of the Institution of Gas Engineers was held at the office, No. 39, Victoria Street, Westminster, on Wednesday last—Mr. JOHN YOUNG, the President, in the chair.

The deaths of the following were reported, and the sympathy of the Council with those who had been bereaved was recorded: Mr. Joseph Hepworth, of Edinburgh, Honorary Member; Mr. Edward Allen, of Liverpool, Mr. Thomas Bower, of West Hartlepool, and Mr. Adam MacPherson, of Edinburgh, Members. With regard to the death of Mr. Allen, expressions of regret at his loss were received from the Société Technique de l'Industrie du Gaz en France and the Council of the University of Leeds. To fill the vacancies thereby caused, the following appointments were made: The President to serve on the Advisory Committee on the Livesey Professorship at Leeds University; Mr. John Bond, to serve on the Corbet Woodall Scholarship Advisory Committee; and Mr. Jacques Abady, to serve on the National Illumination Committee of Great Britain.

Mr. John Bond was appointed as successor to the vacancy on the Committee of Management of the Benevolent Fund caused by the election of Mr. Young as President of the Institution.

It was reported that Mr. J. B. Scott, of Cowdenbeath, had been appointed District Member of Council to represent the North British Association of Gas Managers; and Mr. W. Doig Gibb, the Southern District Association of Gas Engineers and Managers, for the year 1915-16.

The report was presented of further action taken since the last meeting with respect to the shortage of coal supplies, leading to the passing of the Price of Coal (Limitation) Act.

With reference to the Institution certificate for gas-fitters, it was decided, having regard to circumstances occasioned by the war, to extend the period of issue to two years after the conclusion of hostilities. It was decided to extend the Institution certificate to gas-fitters above twenty-five years of age, and of five years practical experience who have passed first-class in the final grade in the "Gas Supply" examination of the City and Guilds of London Institute, in 1915 and previous thereto. Applications for the certificates are to be made through the District Gas Associations within two years of the conclusion of the war.

Applications for the Institution certificates to gas-fitters were approved and certificates ordered to be issued in 44 cases.

The Sub-Committee on the Life of Gas-Meters Inquiry reported that progress had been made with the preliminary work of the investigation.

A communication was received from the Manchester District Institution of Gas Engineers stating that they had laid before the War Office and the Ministry of Munitions the serious depletion of men from gas-works which was taking place. An assurance was received from the War Office that skilled employees of gas undertakings are not to be accepted for enlistment unless they are in possession of a certificate from their employers that they can be spared; and from the Ministry of Munitions, that the wearing of the official badge would exempt the workman from enlistment.

It was announced that, in response to a request from the Royal Society, the names of members of the Institution on active service had been sent, for inclusion in the "War Service Register of Scientific and Technical Men in His Majesty's Forces."

Applications for membership were considered. The following names were approved for inserting in the next ballot-list: For the class of member: Mr. Frederic Chadderton, of Barrow-in-Furness; Mr. Barton Grainger, of Rhymney; and Mr. Glanville Dennis Stone, of Wanganui, New Zealand. For the class of Associate Member: Mr. Stanley Alfred Bevington, of Woolwich; and Mr. George Charles Pearson, of Birmingham. Mr. Robert Burr, of Chester, was admitted as a Student of the Institution.

A report was made of an application to, and an interview with representatives of, the "Advisory Council of the Committee of the Privy Council for Scientific and Industrial Research," on the subject of financial assistance for the various researches being undertaken by the Institution. The Advisory Council asked for particulars of these researches, and their estimated cost. It was decided to supply the information with the hope that funds would be granted to assist the work which the Institution are engaged upon and have in view. The matter was referred to a Committee consisting of the following: Mr. John Young, Mr. A. E. Broadberry, Professor John W. Cobb, Dr. Harold G. Colman, Mr. Samuel Glover, Dr. J. W. Mellor, and Mr. W. E. Price.

The resignation of Mr. Ernest Scears as Abstractor for the "Transactions" was received with regret, and a vote of thanks was passed to him for his services.

Reports of the Emergency Committee, the Publications Committee, and the Finance Committee were presented and adopted.

Coal Distillation and Bye-Products.—A book bearing this title is to hand from Messrs. Thomas Wall and Sons, Limited; the author of it being Mr. J. E. Christopher, of the Wigan Coal and Iron Company. It consists of 90 pages, including 41 illustrations and diagrams. A review of the contents will be given in a subsequent issue of the "JOURNAL." The published price is 2s. 6d.

FRANKFORT-ON-MAINE GAS COMPANY.

Transfer to the Corporation.

THE "Frankfurter Zeitung" of the 31st of August last stated that the Frankfort Corporation had acquired, by friendly negotiations, the greater part of the shares of the Frankfort Gas Company, and consequently the latter has become almost a purely municipal undertaking. The statement proceeds as follows.

The Frankfort Chamber of Deputies, in a private session on the 1st of June last, dealt with the matter, and arrived at the following decisions.

1. The Chamber of Deputies empowers the City Council: (*a*) To accept the offer of the Imperial Continental Gas Association, of the 19th of May, 1915, *re* the sale of 7705 shares in the Frankfort Gas Company, and *re* the transfer to the city of a bank claim against the Frankfort Gas Company for 3,150,000 marks [about £154,400] on the conditions embodied in the Association's written offer; (*b*) To issue a loan for a maximum of 20 million marks [about £980,000], bearing interest not exceeding 5 per cent., to cover the obligations arising from the purchase of the 7705 shares of the Frankfort Gas Company, and other obligations from the acceptance of the offer of the 19th of May, 1915, and to arrange with the Financial Control Committee the terms for the redemption of the loan.
2. The Chamber requests the City Council to at once secure the assent of the Finance Control Committee to the loan.
3. The Chamber expects that when the city has obtained control of the bulk of the share capital of the Frankfort Gas Company, representatives of the town, in addition to members of the City Council, will have seats on the Board of the Company.

The share capital of the Frankfort Gas Company amounts to 13,600,000 marks, of which the city held 3,000,000 marks, according to the terms of the concession of 1909. The city has also acquired shares for about 150,000 marks from private holders; and with the 7705 shares now being acquired, it will possess altogether about 10,855,000 marks of the share capital of the Company. The 3,000,000 marks of shares were allotted at 105 per cent.; but for the 7705 shares now acquired 198 per cent. is to be paid. The shares are to be transferred as from the 1st of April last. They are to remain for the present in the custody of the Berlin bank in which they had been deposited by the former proprietors. The purchase price is to be paid six months after the conclusion of peace. The dividend for 1914, which will amount to at least 10 per cent., goes to the former proprietors.

The city has also to take over a debt of 3,150,000 marks to the Berlin bankers, Messrs. Delbrück, Schickler, and Co., with whom the shares had been deposited as security, and to repay it when the purchase price of the shares becomes due. This is the balance of a loan granted to the Frankfort Gas Company for the construction of the new gas-works in the Schielestrasse, which was repayable in ten annual instalments, with interest at 5½ per cent. The city now cancels the debt, and takes the place of the former creditors.

GAS AND HYGIENE.

DURING this week—that is to say, the opening ceremony took place yesterday afternoon, and Saturday will be the closing day—there is being held, at the Institute of Hygiene, a Lighting, Heating, and Cooking Exhibition, from which it is certain that much good will result. The reason why this assertion may be made with confidence is, in the first place, the excellent manner in which things have been arranged. Then there is the attractive series of lectures and demonstrations which is to be given; and, thirdly, there is the situation of the display—in the heart of the West-end of London, and in the very home of the medical profession. In doing good, the exhibition will, after all, achieve its purpose; for it is intended as an educative display in connection with the objects of the Institute of Hygiene, whose efforts are devoted to the furtherance of "all that pertains to a healthy life and a healthy home." During the next few days, many people will visit Nos. 33 and 34, Devonshire Street, Harley Street, W., and if they are attentive and observant, they will gather much useful information.

Look for a moment at the programme, by which the justification for this remark can, at any rate in part, be tested. There is a series of four lectures—each on a topic which closely concerns everybody, and each by an acknowledged authority on the subject dealt with. This afternoon, the question of "Domestic Heating," from the point of view of economy and comfort in the home, will be the title of a lecture by Mrs. Cloudesley Brereton; while the three following afternoons will be equally well filled by Dr. R. King Brown, who will speak on "Heating and Health," Mr. Leon Gaster on the "Use and Abuse of Light," and Mr. Herman Senn on "Economy in Cooking." All the lectures, it may be pointed out for the benefit of intending visitors, are arranged to begin at half-past three. In addition, there will be demonstrations in cooking each day during the week. Yesterday was devoted to

English, Scotch, and Irish dishes; while to-day and to-morrow French and Russian dishes will be shown in the making. After this, it will be the turn of the Italians and the Belgians—German dishes, it is hardly necessary to say, do not find a place on the list. Saturday has been set aside for popular economical dishes. Students will also be able to get some hints on invalid cookery, and also learn the secrets of bread and cake making—perhaps of more importance now than usual, when affairs have reached a critical stage with so many household budgets.

As has been indicated, there will, from the hygienic point of view, be much that is of vital importance to be learnt from what will be told and done at the exhibition; and the same may be said of what is to be seen. Heating is exemplified—and no other method so good could have been chosen—by a representative display of the latest designs of gas-fires by well-known makers, some of which have been described in our pages within recent weeks. A particularly striking exhibit in this connection, which deserves special mention, is a set of four fires, in armour bright, arranged in a row, with a metal surround to match. There are also radiators, and various water-heaters, including a "Victor" boiler installation, connected-up, with towel-dryer and bath supply. A useful appliance for hospital work is a gas instrument sterilizer. With the small burner which is all that is required, the consumption of gas is infinitesimal; and when connected by a flexible tube to a gas-point, and placed on a glass table fitted with castors, it can be wheeled in a moment to any desired part of the ward, thus frequently saving a good deal of time and trouble.

The most economical and most convenient method of cooking is adopted for the demonstrations—namely, gas—and in addition to cookers actually in use, visitor sare able to inspect other patterns designed to meet both large and small requirements. The lighting, too, leaves nothing to be desired, consisting, as it does, for the main lights, of Sugg three-burner lamps fitted with handsome Holophane globes. Each lamp is individually controlled, and is fitted with a permanent bye-pass on a separate service, and a mercurial seal.

GLOVER-WEST VERTICAL RETORTS.

A Volume Descriptive of Detail, Operation, and Results.

From West's Gas Improvement Company, Limited, of Miles Platting, Manchester, there has been received a new edition of their book descriptive of the Glover-West vertical retort system. The new volume excels anything that the firm have hitherto attempted in this line—so that it would be unjust to treat it as an ordinary manufacturers' catalogue. It is something much beyond this. It is a technical work that is worth having, and worth preserving in the library of any gas engineer; for in it the whole of the system is exposed in every detail and feature from retort-house foundations through to the plant for handling coke. Nothing is missing. It is in reality a digest of a large experience with the system—the system unaltered in its first principles, but showing at this part and that part the improvement in detail effected by experience, and which improvement has enabled continuous carbonization to be applied to small works as well as to large and intervening ones.

There is an explanatory introduction, which is something more than a preface, and should be read. The considerations are here marshalled which must be deliberated upon in determining as to the setting and auxiliary plant to be adopted. One learns as to how rapidly the system has developed, so much so that the firm can now count 75 installations in being or close upon finished in different parts of the world; and if reference be made to pages at the end of the book, the daily capacities of these various plants—large and small—are seen set forth in cubic feet or cubic metres. Looking at the figures, it is not surprising that the firm have had to largely extend their works in order to deal with the demand for the Glover-West continuous carbonization plant, with the auxiliary plant for handling material. The considerations in favour of continuous carbonization are also presented. We will not run over them here. But this is a case where one has to take into account result and the liberty that a system gives in deciding comparatively what a new plant will do. Result is largely purchased by initial cost; but some engineers get no further than a little rumination upon the tons of coal carbonized in relation to initial cost, which tons of coals are really only the half-way house in consideration. The volume is the place where can be seen what the firm have to say on the subject. But let us point to certain salient features: There is the economy of labour in and about the carbonizing plant, which economy is an essential more than ever to-day, when the distribution department claims so much, and yet labour for both works and outside district is so difficult to obtain to comply with maximum need. There is the flexibility of the continuous system—a flexibility obtained by means of the regulation provided, and which enables one to deal with any class of coals, and—by fast or slow working, or high or low temperature carbonization—obtain variations in quantities and qualities of products primary and secondary. It matters not to the contractors what an engineer's desires are in these matters; they place in his hands plant having the capacity for obtaining what he requires. There is the low fuel consumption, which condition is largely subscribed to by the recovery of heat from the spent charges (thus cooling them) before leaving the section of retort below the carbonizing region. Then there is constancy (given, of course, regularity of working and sameness of coal) of illuminating power and calorific value of the gas.

The descriptive work, treating of the main plant and the auxiliary plant, in the volume is well done; and any engineer reading it could from the volume draw up, without going into minor details, a fairly good specification of requirements under his own conditions. There are standard principles in the system; but the plant is seen to be adaptable to all works' circumstances. The illustrations which aid the descriptive work include about seventy reproductions—most of them in several colours, and veritable works of art. Only a few of them are black and white; and these mostly concerning detail. The book is printed on art paper, so that the details of the illustrations have excellent emphasis. Succeeding, are set out in every particular the results of tests of many varieties of coal by independent men who are not in the habit of appending their names to data for which they cannot personally vouch. Calorific and illuminating power charts are included. What the engineer will also find of considerable value is a good index, reference to which will enable him to quickly transfer his attention to any point upon which he requires information. The book is bound in cloth. In fact, externally and internally West's Gas Improvement Company have endeavoured to get as far away as possible from that appearance and general character which spells "catalogue" without the word actually being printed. They have given a technical work on the Glover-West system as designed and operated in this ever-memorable year 1915, and which work the engineer will find will not disgrace, but will add to the value of, the contents of his bookcase.

We have given this extended notice of the book because the firm have in it made a definite departure in adding to the value of the literature from the manufacturers' works. It may be argued that this is scarcely the time to send out a volume of this description. We think otherwise. In the first place, the war has no doubt given the firm opportunities in their offices of getting the work done which they might not have later on through pressure of other matters. In the second place, engineers will be considering *now* their plans as to the work that will be necessary at the conclusion of the war, and the firm want to submit to them the argument in favour of the Glover-West system. The volume, therefore, in our opinion, is quite opportune.

WAR LIGHTING IN GERMANY.

[Communicated.]

There was published in the German newspapers in the second half of September a semi-official announcement which refers to the question of the use of artificial illuminating agencies in the immediate future. It states, in the first place, that, notwithstanding all the efforts put forth, it will only be possible partly to meet the requirements of the civil population in the matter of petroleum during the autumn and approaching winter. The Imperial and Federal state authorities have, therefore, endeavoured for some time past to pay attention to the problem of lighting substitutes. In many places since the beginning of the war electric or gas lighting has taken the place of the former petroleum lighting. Where according to local conditions this has not been possible, acetylene or spirit lighting will come chiefly into consideration to replace oil during the coming winter.

The requisite supply of carbide for acetylene lighting, the statement continues, will only be available, however, in moderate quantities in the winter, as the carbide works are contractually bound to deliver the carbide for the most part for conversion into cyanamide products. Having regard to the great requirements in cyanamide for agricultural purposes, scruples exist against the prejudicing of the production of this material by the employment of large quantities of carbide for acetylene gas lighting, although the announcement naturally refrains from mentioning that the cyanamide is also needed for the extraction of nitrate for explosives. Moreover, a number of defects are associated with acetylene lighting on a small scale [table lamps] owing to unsuitable construction, careless finishing, or inappropriate handling of the lamps; so that for these reasons the authorities abstain from urging the further use of this method of lighting. Apart from this fact, makers on their own initiative have constructed large quantities of acetylene lamps.

A substitute for petroleum lighting of almost equivalent value, although slightly more costly, is afforded by the use of spirit lighting. The principal difficulty—the provision of a sufficient number of the burners which have hitherto all been made of copper or brass—has been overcome by the makers by the construction of a burner of faultless quality without the use either of copper or brass. Accordingly, as through the adoption of suitable measures by the authorities the availability of adequate quantities of spirit has been assured, a working company [the Spirit Incandescent Warlight Company] in Berlin has recently been formed with the co-operation and under the supervision of the Imperial and Federal state authorities, for the purpose of supplying Germany with lamps for spirit incandescent lighting, and particularly the sale of spirit burners for lighting on a small scale. The company will offer this new burner together with wick under the title of the "Warlight" [Kriegslicht] at the retail price of 4s. This amount, however, does not include the price of the accessory parts, such as

the mantle, glass chimney, can to fill the lamp, &c., the cost of which is 1s. 3d. in addition.

In order to promote the introduction of the new burners as much as possible, the State and Communal authorities have been induced to collect orders for the burners, and transmit them to the Warlight Company. The authorities and the communes will receive the burners, which were to have been ready for the market in the third week in September, at a preferential price on condition that they dispose of them to the population at 4s. each. This obligation has been imposed in order to exclude the wholesale and retail trade. On the other hand, the authorities and the communes, through securing the burners at a cheaper purchase price, are to facilitate the obtaining of burners by the poorer population, either by disposing of the burners at less than 4s. each or by letting them out at a rental or by selling on the system of payment by instalments. Any losses can be equalized by the profit realized on the sale of the remainder of the burners.

The official announcement proceeds to state that the new burners can be screwed on to any petroleum lamp. In most cases a filling piece, having a suitable screw-thread connecting between the lamp reservoir and the burner, must be used; but this is not requisite when the reservoir is fitted with a filling screw device for the pouring-in of the lighting agency. A small filling can is used for the supply of the amount of spirit necessary for the warming of the burner—the can only allowing to pass out the particular quantity of spirit required for this purpose.

It is essential that the mantles and glass chimneys should be of good quality; and for this reason the Warlight Company will impose upon retailers who sell the burners the obligation to equip the latter only with mantles and chimneys made by particular factories. As the conversion of existing petroleum lamps into spirit lamps presupposes certain expert knowledge, it is recommended that this work should be entrusted to the retailers from whom the burners are purchased. The retailers will be bound to adhere to the uniform price of 4s. per burner, as well as to the prices fixed for the accessories, the quality of which is to be guaranteed.

The new burners yield a lighting power of 50 hefner candles, as compared with 18 candles of the No. 14 petroleum burner; and the consumption of spirit amounts to about one-twelfth of a litre (0·146 pint) per hour. Thus, at the present price of spirit, the cost works out at ⅛d. per lighting hour. But a reduction in the existing price of spirit is said to be out of the question.

If the brightness of the light should dimish after a long period of lighting, it is sufficient as a rule to clean the lamp and renew the wick, at the price of 3d., in order to restore the lighting to its former condition—the cleaning being entrusted preferably to the retailer. The burner makers would be able to meet the requirements for the construction of spirit lamps giving less light (about 30 candles) or greater light—up to 100 candles—by making alterations in the 50-candle power burner. The former would have the advantage of a lower consumption of spirit. But the price of the burner could not be reduced; and the company proposes for the time being only to make the normal burners.

It is added that spirit lighting, on account of the use of incandescent mantles, is not suitable for those cases in which the lamp would be especially subject to shocks or strong wind. In these instances—such as for market stalls and for cart lamps—acetylene is more appropriate. On the other hand, spirit incandescent lighting is declared to be greatly preferable to acetylene for internal illumination. It is understood that the public authorities intend to substitute spirit for petroleum wherever the latter has hitherto been employed in their departments. It is further suggested by the Imperial authorities that when the lighting requirements can be only partly met, large halls in schools or other large buildings should be placed at the disposal of the population—particularly for the purpose of enabling home workers to continue their activity during the period of dark days. The great lighting power of spirit incandescent lamps is stated to be specially suitable for the lighting of such workrooms.

Coke in Gas-Producers.—Dr. H. Margraf states in a German paper that some difficulty exists in that country in getting the required amounts of gas-producer coal; much more being coked than formerly, to secure the coveted bye-products. This has resulted in constant effort to get coal replaced as far as possible by coke. Many boiler plants already employ coke firing with good success; and recently experiments have been made in ordinary gas-producer practice. At a plant in Lorraine, coke mixed with coal has been used since the beginning of January with complete satisfaction in the heating furnaces for the rolling mills. No changes in the producers were necessary. The work of poking is somewhat less than when coal is used alone. The coke settles down uniformly, and does not form hollow places; for it does not swell and become soft when heated, like coal. The ash removal offers no difficulties; and the coke contains practically no volatile matter, so that no heat is taken up for distillation. The producer therefore showed a tendency to run hot, and it was found that about 10 per cent. more steam than usual had to be mixed with the air. The producers were found to gasify the same amounts of material as formerly. There are at present no exact results as to the comparison of the two materials for gas-producer work; but from a theoretical standpoint, the coke would appear to be the best. It is believed that the gas burns with a shorter, sharp flame; but this is not the case. In the heating furnaces, it shows an extremely long flame, somewhat more transparent than the ordinary flame, but clearly seen.

ELECTRICITY SUPPLY MEMORANDA.

We do not know it is much use inviting our electrical friends to bestow sensible consideration upon the report of Lieut.-Col. Druitt on the terrible railway disaster at Gretna, and not to give way to silly partizan notions, generated by purely commercial rivalry. "Meteor" of the "Electrical Times" did, on the publication of the report, again draw from stock some of the worn arguments based on fallacy; and he pleads for prompt official intervention, obviously for the purpose of placing in the hands of electrical contractors the work of fitting-up trains with electric light, in place of gas light. He does this without having in his possession anything but some vague idea that gas does contribute to railway train fires, and the recommendations of Board of Trade Inspectors, who have never yet investigated the subject to see whether there is any technical justification for the judgment they have formed. Their recommendations are all founded on pure hypothesis. The Gretna railway disaster was one of the very gravest on record. In it three trains, with four engines, were massed in confused wreckage, with death, maiming, and destruction the horrible accompaniments. But with it all—though of the total number eighteen coaches were gas lighted and fifteen electrically lighted—Lieut.-Col. Druitt has to report that there is no doubt the fires were caused by the engines, though he fancies (he has no evidence to show it was so) gas may temporarily have contributed to the intensity of the fire. There is joy in the electrical camp over this small piece of vagueness; anything, however scrappy and unsubstantial, seems to serve the electricians. So, again, we have the prayer for official compulsion in effecting change. The hurling of hundreds of poor fellows into eternity through a colliery explosion caused by electrical sparking or short-circuit has no effect on these men; nor has the sacrifice of human lives in factories through electrical operation that Mr. Scott Ram annually reports to the Home Office. These men can be callous and blind to these things when their own interests are concerned; but when, on the lamest pretext, gas can be assailed, hands are held up in pious horror, and the scream for Government intervention is at once heard. Hypocrisy surely never had better illustration.

Hypocrisy Illustrated.

In view of the terrible nature of this catastrophe, and the evidence as to the cause of the fire amid the wreckage, why did Lieut.-Col. Druitt go out of his way to reiterate the old desire for the consummation of the whim for the eviction of gas from railway trains and the installation of electricity? Not long since an expert on lighting, though with electrical preferences, showed very conclusively that there were practical reasons why such a change was not the simple matter imagined by some people with superficial knowledge. If there is one lesson about this accident which stands out clearly above all others in connection with the matter under consideration, it is that, if all that has been said derogatory of gas lighting in trains were true, this accident ought to have intensified many times the misdeeds of gas. But it has not. It illustrates how conceptions and conclusions can be misderived. With some people of shallow perception, gas must be at the bottom of the mischief because it is present. It must be the cause of fire, and of explosions. But here we have only one brakesman who "remembers" seeing a tongue of fire about two yards high, and who "thinks" the tongue was due to burning gas on top of the wreckage *just about where the engine of his train was lying*. What a pretty lesson in deduction from the obvious premises. This man had not been trained, and his own qualifications did not enable him, to make observation of cause and effect. An engine the cause; a tongue of flame from gas the effect! "Meteor" quoted, with relish, and apparently accepted as conclusive, this sapient instance of ripe and sharp intelligence. Then an engine-driver asserted that, while he was engaged in trying to extinguish the fire, there was an explosion, and pieces of metal about the size of his hand rose out of the wreckage, which he ascertained to have come from the gas-tanks. How he did this does not appear to have been the subject of inquiry. Some witnesses spoke to hearing explosions; and some did not hear anything of the kind, which conflicting testimony shows how untrustworthy is evidence drawn from a scene of such wild and fearful excitement. George Hutchinson, a fireman, spoke to hearing two or three explosions from among the *débris* near the engine of his train; the noise sounding like a gun going off. James Benson, a driver, noticed one or two severe explosions; but he did not see anything in the nature of a sheet of flame as from gas. John Cowper, a driver, heard repeated explosions. Another driver, Andrew Johnstone, was blown off his footplate by an explosion; but he could not say whether it was due to the gas-tanks or to ammunition. He did not observe any sheet of flame; but he heard several explosions after the one that blew him off his footplate. We are here getting in the vicinity of an alternative to gas. A guard, Douglas Graham, had not time to get his red flag and detonators. Lieutenant J. C. Bell stated that, so far as he knew, there was no loose ammunition in the train; but he thinks some of the boxes of ammunition must have been broken, as he saw some lying about afterwards. This evidence seems to clear up the real cause of the explosions heard. But Lieut.-Col. Druitt makes a very interesting remark. He says that a "large number"

Cause and Effect.

(remember eighteen of the total number of coaches were gas lighted, and the remainder electrically lighted) of the gas cylinders in the vehicles were very badly damaged—several of them being torn open, while others bore "traces" of having been ruptured by the excessive pressure of gas caused by the intense heat. It would have been very instructive had Lieut.-Col. Druitt dilated further on this question of the pressure needed to rupture steel vessels by heat generated under such conditions.

Findings and Recommendations.

We make out that nine of the witnesses testified to the fact that the four engines involved, with wreckage piled up about and over them, were the centre of the fire that raged. Lieut.-Col. Druitt says a fire under the conditions was "inevitable." This would be fairly plain to any one of ordinary intelligence reading all the evidence without prejudiced eye. He considers that the outbreak on the main part of the wreckage was due to live coals from the overturned engine of the troop train. With the ashpan forced in and the fire-bars displaced, this would allow free access of the live coal to the wreckage. Coal, too, was fed into the fire from the tenders of at least three of the engines; and such coal as was left in the tenders was afterwards found consumed. Our electrical well-wishers ought after this also to protest against such a combustible as coal being carried on trains. Then the Inspector proceeds to say that the fire was afterwards intensified by the escape of gas from the cylinders as they burst. It would be exceedingly interesting if Lieut.-Col. Druitt would, in the interests of scientific knowledge and fact, inform us how the gas from cylinders charged at Larbert to the extent of five or six atmospheres—cylinders badly damaged and ruptured—would contribute to the local intensity on finding such free outlet to the atmosphere. It is really strange how high-pressure gas let loose persists in hanging about railway wreckage for the sole purpose of assisting in constructing a case for the supersession of gas by electricity. The phenomenon should be strictly investigated. However, the Inspector believes that fire would have occurred even if the vehicles had all been fitted for electric lighting, as a separate fire broke out immediately from among the waggons of the goods train, caused by the ashes from the leading engine of the express. We wonder what the Editors of the "Electrical Review" have to say to this. Fancy tough old railway waggons, without gas on them, being burned up by fire caused by live ashes from an engine! This is quite against all electrical theory governing the creation of fires on railway trains. But now we come to the recommendations. Lieut.-Col. Druitt advises that all railway coaches should be constructed of steel as far as possible, and all timber and other combustible material should be rendered non-inflammable. Then, though the evidence is so amply complete that gas was not a contributor to the fire in this awful disaster, and that fire was "inevitable" even with all the coaches electrically fitted, he proposes that gas lighting should be abolished and electric lighting be substituted as opportunity provides. We wonder why the second of the recommendations is necessary if the first one is carried out. Assuming that gas had a proved (part or whole) responsibility for these train fires, why, if the carriages are made fire-proof, deprive the railway companies of the economy of gas lighting, and the passengers of a light of low intrinsic brilliancy and of good composition? The absence of gas in this disaster, without fire-proof construction, would not have averted fire. Lieut.-Col. Druitt confesses as much. The whole report, read rightly, is a fine tribute to the safety of high-pressure gas under most terrible conditions. Gas came out of it with unblemished reputation; and yet predilection and commercial bias still ask for its conviction and eviction.

Jealousy.

Because incapable of equalling, there is great jealousy in the electricity supply industry over the work of the British Commercial Gas Association. This jealousy leads to contemptuous remarks, and those remarks—well it would not be complimentary to give them their proper description. A correspondent of "Electrical Industries," calling himself "Consumer," condemns this jealousy. He says: "The lack of enterprise of the electrical industry in regard to advertising is simply pitiful, and to sneer at gas manufacturers while they are reaping brilliant results from their methods of publicity betrays jealousy, and nothing else." He is persuaded that, by a properly organized campaign, "the public could be easily convinced of the merits of electricity, as compared with other sources of heat, light, and energy. The Editor of "Electrical Industries" hopes that "Consumer" does not suggest that "it is necessary for the electrical industry, with so much better a case to put before the public to follow the patent medicine vendor so closely as the gas industry does." Poor fellow! Jealousy must relieve itself somehow, though the choice of method is not always wise or pretty. But by the way, if the public could be so easily "convinced of the merits of electricity," and if electricity has "so much better a case to put before the public," why does it want to advertise? Surely nothing can prevent it advertising itself by proved merit, and so making express headway.

Short-Circuits on War Vessels.

Strange happenings occur to war vessels. Ships are blown up or set on fire without being torpedoed or mined. It is remembered how a French war ship some time ago was destroyed, and a great sacrifice of life resulted. The evidence went to show that, prior to the trouble, there had been difficulty with the electric lighting, and, above all places, in or contiguous to (we forget which) the powder magazine. Other singular destruction of war ships has occurred, and no reasonable explanation has been forthcoming. Now the Italian battleship *Benedetto Brin* has been blown up, and many lives have been lost. There is to be an inquiry into the cause of the explosion; but meantime it is noted that the "Messaggero" of Rome states that "the explosion would appear to be due to a short-circuit."

The "Fairy Tale" Cooker.

We should imagine the "Fairy Tale" title of this cooker a most appropriate one; though it seems to go under another name on occasion—the "Good Housekeeping" cooker. It is referred to in a letter by Mr. F. W. Fisher, of Adelaide, published in the "Electrical Review." But the cooker appears to be of American extraction. Reference was recently made to an automatic cooker, with thermostat control, introduced by the Westinghouse Company of America. Now the "Fairy Tale" cooker claims automaticity and other virtues unexcelled by any antecedent cooker. The principle is low-temperature operation; the temperature maintained being only 220° to 250° Fahr. The idea is that cooking can be carried on at about the boiling-point of water. Perhaps so; but we do not like all our food cooked as though it had been boiled. It is confessed that the system takes longer than where higher temperatures are employed. We should say much longer; and the longer the sweating process continues, the greater the exudation of the nutritive qualities of the meat. The oven is a cylindrical structure with two wings at the top serving as the hot plate. The shell of the oven is of polished steel, with cast-iron ends, &c., nickel-plated over copper. The insulating materials are mica and glass, and are tested, after completion, with 1000 volts. Mineral wool and ground cork are employed as thermal insulators. Two copper jackets form a double-walled steam chamber, and they are electrically welded together at the joints. Between the jackets is contained a small quantity of water; and the rest of the space is exhausted of air. A phosphor-bronze buckled diaphragm is attached to the bottom of the oven. The heating elements are placed directly under the outer copper jacket; and, when energized, these convert the water into steam, which distributes the heat through the space around the cooking vessels. When the temperature reaches 250° Fahr. and the steam pressure about 15 lbs. above atmospheric pressure, the diaphragm changes its shape, and presses down a loose pin, which opens the switch contacts, and turns off the current. When the temperature has fallen to 220° Fahr., the diaphragm returns to its former position, and the switch closes again. That is the electrical description. The "Review" finds the cooker would be objectionable when a meal is wanted in a hurry; and it certainly is not the best method for frying or for cooking pastry.

Costs.

We, of course, should be sorry to harshly judge anyone, or to characterize certain statements by handy expressions that readily come to mind. It is said that the cooker will work at less than half the cost of gas, owing to the diminished losses due to radiation and convection by employing low temperatures. Mr. Fisher asserts this, on prices for gas of 5s. 3d. per 1000 cubic feet and for electriciy of 2½d. per unit. The amount of gas purchasable for 2½d. at the price mentioned is about 40 cubic feet; and probably this would be gas of approximately 600 B.Th.U. gross, or 24,000 B.Th.U. for 2½d. Half a unit of electricity gives 1710 B.Th.U.; and under this is said to do an equivalent amount of work to the 24,000 B.Th.U. But there is a contradiction in an illustration given by Mr. Fisher. He says that an average meal consisting of a joint, two kinds of vegetables, and one or two varieties of sweets can be cooked with a consumption of "under one unit," whereas with gas 80 to 100 cubic feet are required. Now the 80 cubic feet of gas only costs 2d.; a unit of electricity 2½d.—under 1 unit would probably represent about 2d. There is equality. But what of the gas-cooker that takes 80 to 100 cubic feet of gas for cooking such a modest meal? Thank heavens we have had nothing of that sort in the way of gas-cookers in use in this country for the last forty years. The working man's wife with a simple construction of gas-cooker puts a good "square" meal through for the family on Sunday, by placing a penny in the slot; and, if she knows her business, there will be a surplus quantity paid for for some other purpose. The "Electrical Review" should be careful of fundamentals. There are gas-cookers in America and Australia; and there are gas-cookers such as are used in this country.

Gas from Peat.

According to the United States Consul at Amsterdam, the principal gas-works at Akkrum, in the Province of Friesland, is extracting gas from peat mixed with coal. It is stated that if peat alone were used, the retorts would become too hot, because of the steam created by the moisture always found in peat. Accordingly the retorts are filled with two parts by weight of coal to one part of peat. The gas is declared to be of excellent quality. The peat is entirely consumed in the process; and yields no bye-products. All coal, and particularly gas coal, is at present very scarce in Holland, "as it has to be imported from a great distance at heavy cost."

THE ELSWICK WORKS OF THE NEWCASTLE-UPON-TYNE AND GATESHEAD GAS COMPANY.

A Partial Reconstruction.

In connection with the half-yearly meeting of the North of England Gas Managers' Association last Saturday [as reported elsewhere], the members paid a visit to the Elswick works of the Newcastle-upon-Tyne and Gateshead Gas Company, which have recently been reconstructed, under the direction of the Company's Engineer, Mr. Thomas Hardie. An interesting account of the works and alterations had been prepared for the use of the visitors, in the shape of an illustrated pamphlet, to which we are indebted for the particulars contained in this article.

The Old Carbonizing Plant.

Gas was first made at the Elswick Gas-Works in 1859; the carbonizing plant consisting of four benches of eight ovens, each containing seven retorts about 18 inches diameter in section. About the year 1870 two other benches were erected; and in 1873 and 1874 the works were practically completed by the installation of a further two benches. From that date the works consisted of 448 through retorts. The same system was followed throughout—the newer benches being duplicates of the older except as regards the section of retorts, which was changed to 20 inches by 14 inches, Ω shaped. The general scheme was also the same. Coal was brought into the works on a high-level railway, and tipped into small waggons, from which it was deposited in front of the benches by means of an overhead railway system which ran in three parallel lengths throughout the full length of the double retort-house. The ovens were all direct-fired and hand-charged. The hot coke was removed from the retort-houses in iron barrows, and deposited in the coke-yard. This method was in operation as late as last winter, when it was necessary to work one of the last two benches of these old-style retorts which were then still in existence.

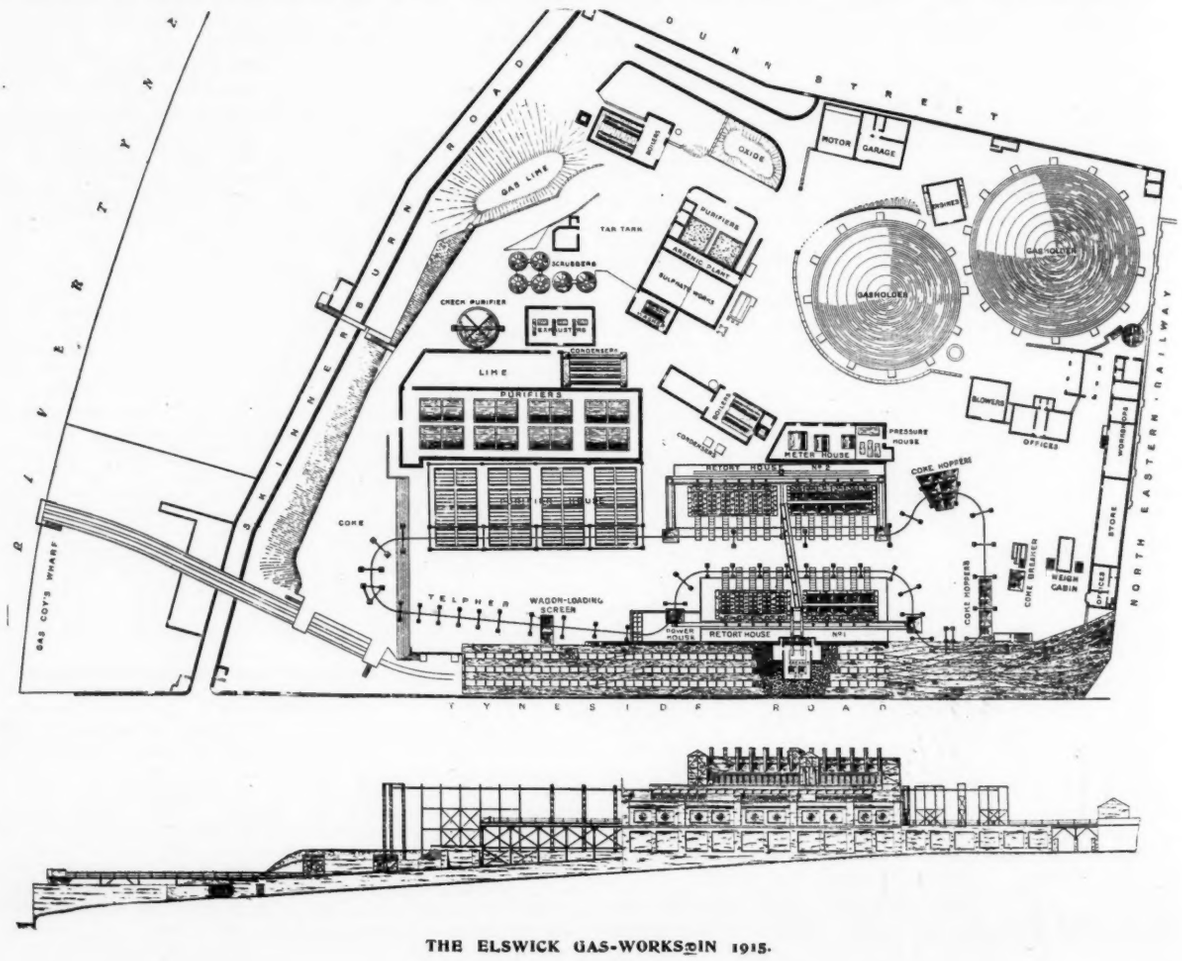
The works reached their maximum output in 1895, when nearly 5½ million cubic feet of gas was made in twenty-four hours, and the output for the year was 1140 million cubic feet. From that year onwards the developments at the Redheugh station, where the working was more efficient, caused the Elswick output to be gradually reduced, until, in the years 1909 to 1911, it was less than half what it was in 1895.

The reconstruction of the Elswick retort-houses was decided upon in the latter part of 1911; and on Dec. 29 of that year a tender was accepted for an installation of vertical retorts on the Glover-West system.

The site of the works is by the side of the river, and there is a public roadway between the riverside piece of the land and the larger part, on which the manufacturing and purifying plant is built. Further, the land is on a steep slope, and has been found to consist for several feet in depth of made-ground, with a substratum of running sand (reaching in many parts to a depth of 14 to 16 feet below ground level); while beneath the sand is a bed of good clay. Owing to the falling-away of the ground on three sides, it would have been essential, before heavy weights could be placed on the sand, to contain the ground with some form of wall. As part of the old plant was to be used while the first portions of the new plant were being built, it was not possible to proceed immediately with the demolition of the whole of the buildings covering the land to be occupied. Therefore, even if it had been preferable, the building of such a wall was impossible; and it was decided to sink all the foundations carrying considerable weights to the clay level. The cost of the foundations was consequently considerable; and the depths to which the excavations had to be sunk greatly retarded progress. The amount of material recovered from the old buildings allowed of all the concrete work being executed at a cost of 13s. 3d. per cubic yard.

No. 1 Vertical Retort-House.

The demolition of the east, or No. 1, retort-house was started on Jan. 8, 1912, and progress had been so far made by March 26 as to permit of the commencement of the brickwork of the new settings. The installation is now known as No. 1 vertical house; and the first retorts were charged on Jan. 18, 1913. No. 1 vertical house consists of ten settings, each of eight retorts. The producers are of the ordinary horizontal bar type; and the producer gas is passed into two vertical flues from which supplies are taken, mixed with heated secondary air, passed round each half of the setting, horizontally, and returned to the front, where the waste gases from all the horizontal chambers are collected in two vertical flues, which conduct them to the top chambers of the setting, whence they flow through two chambers, round the retorts,



THE ELSWICK GAS-WORKS IN 1915.

to the other side of the setting into the chimney. Each setting has its own producer and chimney.

No. 2 Vertical House.

No. 2 vertical house consists of twelve settings, each of eight retorts. The producers are of the step-grate type, and the heating is altered, inasmuch as the gases are passed straight from one side of the setting to the other, and do not return to the producer side again till the third chamber from the top is reached. This improvement has resulted in each side of the retorts being heated absolutely equally. The effect of the greater evenness of distribution of heat throughout the combustion chambers, and the greater average temperature to which the retorts are heated, is that a considerable increase in the output per retort is secured without in any way impairing the refractory materials of which the retorts and combustion chambers are constructed.

In tests made previous to the erection of the No. 1 installation, it was found that Durham coal did not pass so rapidly through the retort as Yorkshire or Lancashire coal; and it was hoped to increase the throughput by lengthening the retorts. In the first installation, however, this was found to be of no advantage. The retorts were therefore shortened in the second installation, and the section altered so as to reduce the thickness of coal in the retorts without reducing the retort capacity. Many other minor improvements are noticeable.

The benches in the first installation are carried on brick arches; but in the second they are carried on ferro-concrete piers and girders. This has resulted in making the discharging floor less enclosed, giving more freedom for working, and improving the conditions of light and ventilation. A similar improvement has been effected in the charging floor, by raising the collecting mains, resulting in the removal of any tendency to form pitch in the mains. The arrangements for the inspection and control of the heats are better in the second installation.

The demolition for the No. 2 vertical house consisted of the removal of one-half of the old retort-house still standing, and was started on Nov. 17, 1913. The brickwork of the vertical benches was commenced on March 9, 1914. The six ovens of the south bench were carbonizing coal by Feb. 2, 1915; and the second bench is now practically completed.

Handling and Storage of Coal.

In No. 1 house, the overhead coal-hoppers carry a 24 hours' supply of coal; while in No. 2 house a 48 hours' supply is stored. Between the two retort-houses there is a distance of 41 ft. 2½ in., and a roadway of 16 feet between the two telpher tracks.

The overhead railway on which the railway waggons of coal were run to deliver into the smaller waggons of the Company—for use in the old horizontal houses—consisted of an embankment 23 ft. 3½ in. high by 35 ft. wide. The sides of the embankment were supported by rubble walls, which, during their long life, had become very much distorted, and had every appearance of coming to an end by a general collapse. This embankment was the property of the Railway Company, though rented by the Gas Company. It was considered essential that the embankment should be rebuilt; and to permit of this being done, the land was purchased.

It was decided that the new overhead railway should extend along the easterly wall for a distance of 535 feet, and that the portion between the new vertical house and the street should form the coal-store. Broad flange rolled steel beams were largely used in the construction of this viaduct, permitting it to be designed in an exceptionally strong and simple manner, though, owing to the contour of the site, the height of the rails above the ground level increases from 23 ft. 3½ in. at the north end to 47 ft. 6 in. at the south end. It was subsequently decided to make use of a length of 120 feet to the north of the retort-house as an extension of the coal-store, and the open side of viaduct was bricked-up to make it suitable, though no covering has yet been erected over it. The total storage capacity for coal is nearly 6500 tons.

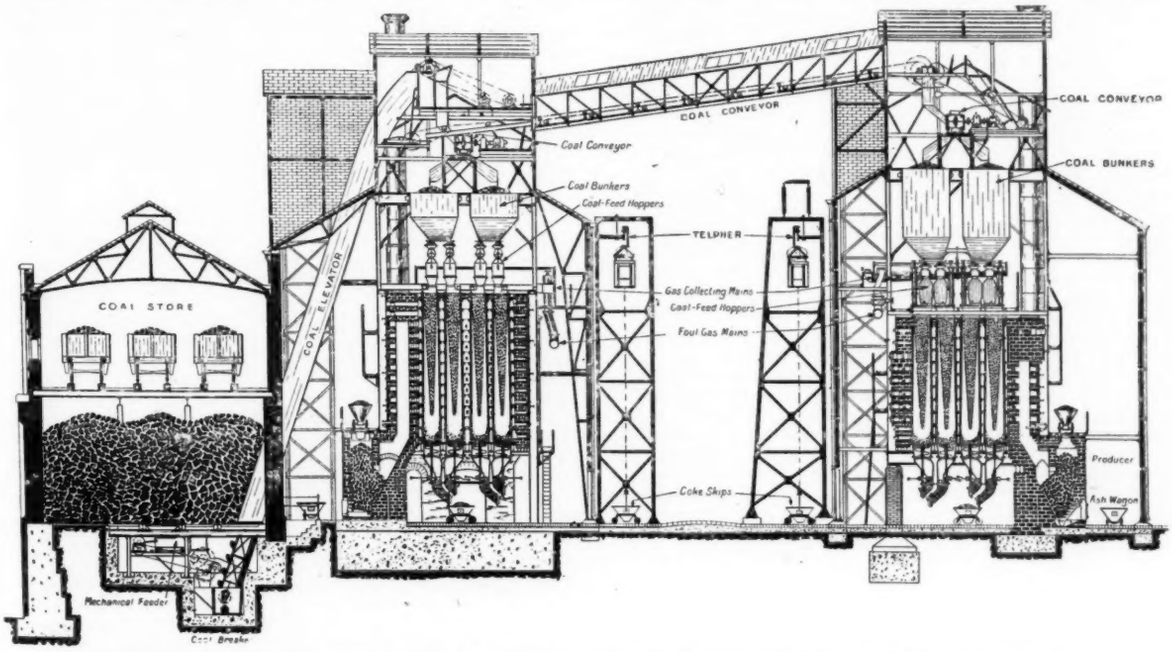
The viaduct was designed to carry 20-ton coal waggons, which capacity is now usual upon the North-Eastern Railway. With regard to this work, which was completed towards the end of the year 1912, it is interesting to record that the whole of the railway, including timber-work, was laid down by the Company's workmen; and the large number of points and crossings were made in the Company's workshops.

While these alterations were in progress, it was necessary to deliver coals in the portion of the old retort-houses still working. For this purpose a temporary timber viaduct was erected; and a portion of this continued in use until January, 1914.

A weighbridge is placed on the viaduct near the junction with the Railway Company's sidings. The steelyard is covered by a house constructed on a cantilever extension of the cross joists; and the fact that the vibration of moving waggons does not in the least affect the weighbridge is a fairly good proof of the stability of the viaduct.

Coal Breakers and Elevators.

The coal-breakers are placed immediately under the floor of the coal-store; and, without trimming or tipping, some 575 tons of coal



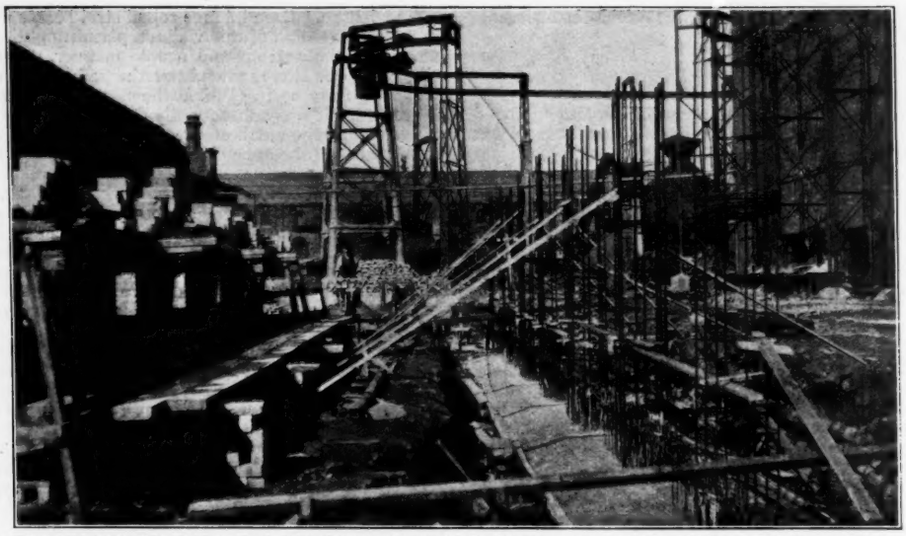
TRANSVERSE SECTION OF THE COAL-STORE AND RETORT-HOUSES AT THE ELSWICK GAS-WORKS.

gravitate into them from the store. There are two coal-breakers and two elevators, each having a capacity of 30 tons per hour. The elevators can be made to deliver into one of three conveyors—into a conveyor running over the hoppers of the south bench of No. 1 house, into one running over the coal-hopper of the north bench, or into a conveyor which carries the coal across to No. 2 house. The conveyors over the coal-hoppers are of the push-plate type, and each has a capacity of 30 tons per hour. The cross conveyor to No. 2 house is a rubber belt, and has a capacity of 60 tons per hour. This conveyor delivers into two push-plate conveyors, of 30 tons capacity each, for supplying the hoppers in this house.

Coke-Handling Plant.

The coke is discharged into skips having a capacity of about 17 cwt. The skips are carried on bogies which travel along rails; and the method of working consists in discharging four retorts into one skip and running this clear of the house, where it is picked up by the telpher. The skip is returned empty to the bogie, and run back into the house ready for the next four retorts of that setting. There is in this way, therefore, one skip and one bogie for each setting, The ashes from the producers are similarly dealt with; being filled direct by the firemen into skips which are run on rails under the telpher, by means of which they are removed and emptied.

The telpher system consists of an endless track, and is 1225 feet long. There are three telphers; and they can each be used for: (1) Removing coke from the retort-houses; (2) removing ashes from the retort-houses; (3) filling four supply hoppers for the



FERRO-CONCRETE PIERS OF THE SECOND VERTICAL HOUSE AND PART OF THE TELPHER TRACK.

producers; (4) loading or unloading coke or other material into the overhead railway.

The coke not required for producers is deposited by the telpher into stationary screens, where it is delivered (sized) into hoppers for despatch to the town; also into a "jigger" screen, where it is delivered into railway waggons, and the breeze and small recovered into hoppers (for town trade) or into the storage yard. In the storage yard, the telpher track standards are encased in concrete for protection.

There are three sets of overhead storage hoppers—including a ferro-concrete hopper under construction—having a capacity for 100 tons of breeze, 80 tons of broken coke, and 42 tons of unbroken coke. The "jigger" screen has a delivery capacity of 40 tons per hour.

Power Plant.

The whole of the machinery is driven by electric motors; and the electricity for these is generated by three sets of gas-engines and dynamos. The power-house is 55 feet by 24 feet by 14 feet high, and is covered with a girder and concrete roof, which carries a large water-tank and supports one pair of standards for the telpher track and a hopper for the producer coke.

There are three complete generator sets, each consisting of a 52 B.H.P. gas-engine coupled direct to a 35 K.W. compound-wound dynamo of the protected type and generating continuous current at 220 volts. Two sets are sufficient to produce the necessary current when all the plant is working as required, and one set is generally sufficient when the coal-handling plant is not in operation. The following is a list of the motors; but most of them are only in use intermittently:

Coal-breakérs	2	motors	25	B.H.P. each
Coal-elevators	2	,,	13½	,, ,,
Coal-conveyors	3	,,	6½	,, ,,
Do. do.	2	,,	4	,, ,,
Coke-extractors	2	,,	8	,, ,,
Do. Do.	2	,,	9	,, ,,
Telphers	6	,,	10	,, ,,
Coke-lift	1	,,	9	
Do. Do.	1	,,	12	
Jigger screen	1	,,	10	

Condenser.

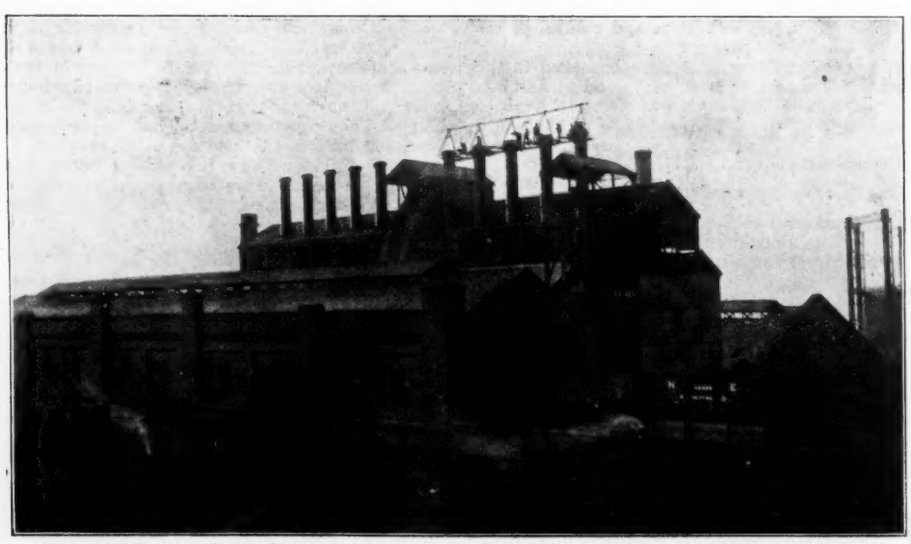
There was a very long length of 20-inch cast-iron main around the retort-houses and purifying-house, and through which the gas passed from the retort-bench to the condenser; and as the demolition threw this out of use, it was found necessary to replace it by some form of condenser. A water-tube condenser was adopted. This condenser is divided into two sections, each having a capacity of 1,500,000 cubic feet of gas—making a total capacity of 3,000,000 cubic feet per twenty-four hours. The connections are arranged so that the two sections may be used in tandem, separately, or reversed.

Purifying House.

On part of the site of the old retort-house there is now being erected a purifying house 172 ft. by 68 ft. 9 in., which will contain eight overhead purifiers. Owing to the telpher track running through one side of the house, the construction is somewhat uncommon. The telpher will be utilized for conveying from the rail the necessary oxide, and for the purpose of despatching the spent oxide. The purifier boxes are 34 ft. by 31 ft. 6 in. by 6 ft. deep, of usual construction. They are to be worked in two sets of four each, with Weck valves. The boxes are emptied through the bottom plates. For the filling of the boxes and the lifting of the covers, there are four endless ropes running the whole length of the house, and driven from a shaft at the south end, worked by a 25 B.H.P. gas-engine. In the old purifying house are sixteen boxes, 19 ft. by 18 ft. by 5 ft. 2 in.; but they have deteriorated, and are very unsuitable for use with oxide of iron.

Water-Storage Tank.

A cast-iron tank, 42 ft. 6 in. long by 19 ft. 6 in. wide by 6 ft. deep, and having a capacity of 30,000 gallons, has been erected on the strengthened walls of an old engine-house. The water is pumped from the river, and is used for the condensers in the first instance and subsequently for the producers or for the quenching of the coke.

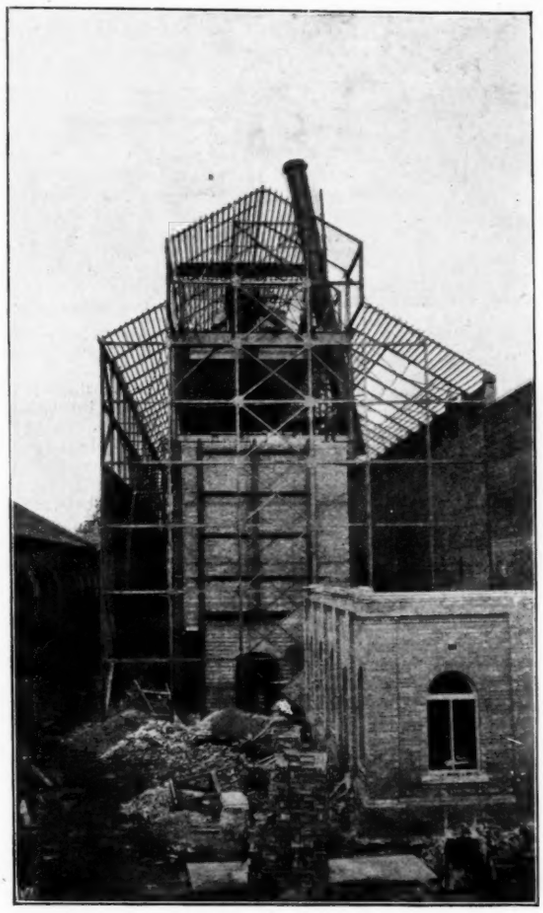


COAL-STORE IN THE FOREFRONT, AND THE FIRST VERTICAL HOUSE NEARING COMPLETION.

Shops, Stores, and Offices.

The introduction of so much additional machinery into the works necessitated an installation of machine-tools to enable repairs to be more easily undertaken; but, owing to present difficulties, the requirements in this respect have not yet been fully met, although a rearrangement of the shops has left a certain amount of space available for the purpose.

New methods for taking out costs in greater detail and with greater accuracy required some improvement in stores, and to obtain more accommodation an upper floor was placed in the line of buildings which were then occupied as shops and stores; and the office buildings which had to be partially demolished to permit of the extension to the viaduct were rebuilt in a larger and more convenient form. The result of these alterations may be



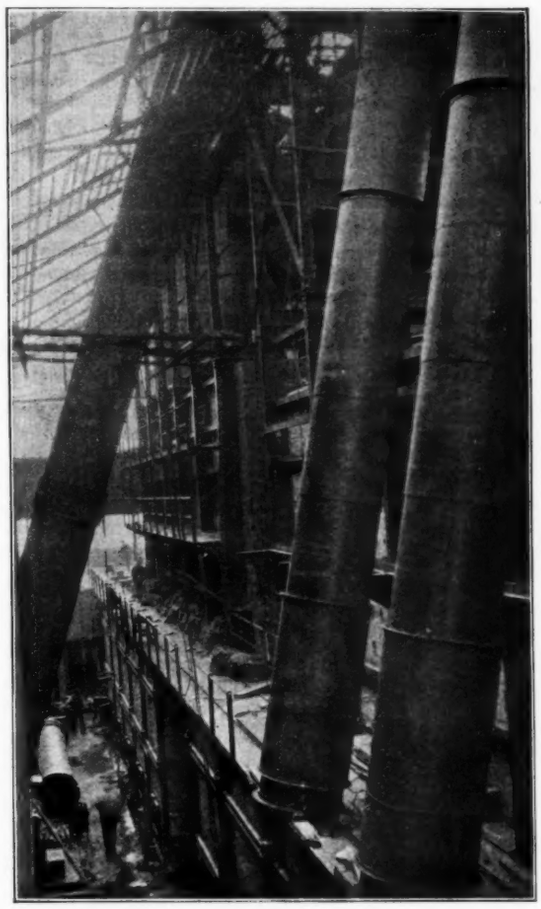
The First Vertical House in Course of Construction, with the Power House in the Foreground and the Chimney being lifted into Position.

seen from the increased quantity of useful floor area obtained from the same ground space:

	Before Alteration. Sq. Ft.		After Alteration. Sq. Ft.
Joiners' shop floor	624	..	946
Smiths' and fitters' shop	1333	..	1978
Stores	538	..	2308
Offices	817	..	1780
Totals	3312	..	7012

Mess-Rooms and Lavatories.

Mess-rooms and lavatories have been built over the station-meters. The roof of the meter-house had for some years been greatly in need of renewal; and in carrying out the work it was decided to put in an upper floor which would be used for mess-rooms. A floor, consisting of steel joists and concrete, was therefore laid across the whole of the house, and the walls were raised 12 feet, and a new roof constructed. Floor space was thus provided for two large mess-rooms, a latrine with accommodation for nine persons, and eight bathrooms and wash-rooms. The whole of the hot water is provided by means of a Royle's calorifier from the ordinary steam-boilers; the temperature of the water being regulated by means of a Buley blender. Each bathroom is divided by a partition, which gives every convenience for dressing and undressing. The bathrooms are heated by steam-radiators supplied from an independent, and smaller, calorifier.



The Producer Side of the Vertical Settings, with the Chimneys ready for Lifting into Position.

Coke Motors and Garage.

The Company maintain twelve one-ton motors, which are used for delivering coke to consumers in Newcastle, Gateshead, and district. An old stable and coach-house has been extended to form a suitable garage and repair shop. The covered area of the stable was 654 square feet, and the added area 1220 square feet—giving a total of 1874 square feet.

Gas Compressors.

During the years 1912-13 four gas-compressors were installed for the purpose of supplying high-pressure gas to the town and also for supplying an outlying district about 7½ miles away. The compressors are of the following capacities: 5000, 15,000, 25,000, and 40,000 cubic feet per hour.

Figures Showing Differences between the Old and New Systems.

	Old.		New.
Area of retort-houses per ton of coal carbonized, square feet	114	..	40
Area of coal-stores do. do.		..	30
Capacity of coal-stores, tons	3,529	..	6,486
Length of double-rail sidings, feet	762	..	1,764
Gas made per ton of coal carbonized, cubic feet	11,200	..	12,764
Coke and breeze sold per ton of coal carbonized, cwt.	9·5	..	11·43
Tar made per ton of coal carbonized, gallons	9·75	..	9·31
Sulphate of ammonia made per ton of coal carbonized, lbs.	19·0	..	19·79
Carbonizing wages per 1000 cubic feet, pence	4·91	..	1·029

The figures for the new system show the actual six months' working July-December, 1913, which is the only period over which the verticals worked as a complete unit, and under normal conditions. The second installation is not yet complete; but the results have been even better since a portion of it has been put into operation.

Export of Coke.—The Coal Exports Committee wish it to be known that, though it is at present considered desirable severely to restrict the exportation of gas coke, the same necessity does not arise in the case of coke other than gas coke—such as foundry or blast-furnace coke—licences for the export of which are being freely granted.

A THERMAL STUDY OF THE CARBONIZATION PROCESS.

By Harold Hollings, B.Sc., and Professor John W. Cobb, B.Sc., F.I.C.

On May 17 last there was communicated to the Chemical Society a "Thermal Study of the Carbonization Process," by Mr. Harold Hollings and Professor Cobb, of Leeds University. In the "Journal" for Aug. 10 [p. 290] an abstract of this interesting paper appeared; but it has since been suggested that value may attach to the results set forth in the paper, not only now but in future, and that it would be useful if reference to it, in full, could be made in the pages of the "Journal." We have, therefore, secured (through Professor Cobb) the consent of the Council of the Society to reproduce the text of it from the July issue of the Society's "Transactions."

This research was commenced because of the inconclusive nature of the evidence supporting the current conception of coal distillation as an exothermic process, and because of the obvious importance of the question to the carbonizing industries.

The more technical aspect of the problem has been presented by the authors in their paper read before the Institution of Gas Engineers;* and we now collate the results for scientific purposes. Our critical study of the work already done on the thermal balance of carbonization, and our own early experiments, led us to the conclusion that both exothermic and endothermic reactions occurred; and the net quantity of heat involved was small; and that whether the net thermal result of the carbonization process at the actual reaction temperatures † was an evolution of heat or not was still an open question. When, however, the difference between the calorific values of coal and of its products of distillation ‡ was made the criterion of exothermicity in carbonization, it appeared to be proved that the distillation was exothermic—that is to say, when each reaction was taken at its value at 15° (a convention in thermochemical tables). The value of determinations of the net thermal result of carbonization is limited, in one sense, because the process cannot be represented as a single reaction. There are at different temperatures definitely exothermic and endothermic reactions which balance more or less; and, although a net result gives no evidence of the existence of such reactions, they may be of considerable importance. Modern industrial conditions are bringing into greater prominence the problems of the storage of coal; and any evolution or absorption of heat occurring in a mass of coal at a comparatively low temperature should be considered as increasing or decreasing the liability to spontaneous heating. The same consideration is of importance in determining the behaviour of masses of coal underground when raised in temperature from any cause in any atmosphere.

The experimental method we employed consisted in heating side by side, under the same conditions, a coal which underwent carbonization and a coke which could be regarded as chemically and thermally inert, and noting by means of the differential arrangement of thermocouples, devised by Roberts-Austin§ for the examination of metallic alloys, the extent to which the temperature of the coal became higher or lower than that of the coke in various stages of carbonization. Complications arising from the secondary decomposition of volatile distillation products were minimized by using a small quantity of coal, and sweeping away the products by a stream of nitrogen. Having by this means obtained "heating curves" of a bituminous coal which showed that the distillation consisted of several distinct stages, heat evolving, heat absorbing, or thermally neutral, we continued our experiments to the examination of coal extracts, to ascertain how far it was possible by this means to trace characteristics of the heating curve of coal to the influence of constituent parts of the coal itself. The heating curves of different types of coal were also constructed, and those of cellulose, dehydrated cellulose, and lignite, in order to trace, by comparison of the curves obtained, the possibly existing influence of degradation products of cellulose still present in the coals.

Experimental.

The essential parts of the apparatus used are shown in fig. 1. The coal and coke were heated in very thin fireclay boats, an enlarged view of which is given in fig. 2. A is the boat containing the coke; B that containing the coal. Fig. 3 gives the end view of the boat, and shows the three holes through which pass along thin silica tubes D, giving necessary protection to the thermocouples. C is a lid of nickel gauze to keep the coal in position during heating, after it has been packed round the silica tubes in the boat. This lid is held down by pushing it under the curved sides of the boat, as shown in fig. 3. The coke standard is previously prepared by packing the coal in A, and heating it to 1100° in an atmosphere of nitrogen.

The porcelain tube, E, in which the boats are placed, is heated by an electric furnace, F. At each end of the porcelain tube is fitted a rubber cork and a glass T-tube. The silica tubes pass through the porcelain tube, and extend beyond the T-tubes at each end. Nitrogen from a cylinder is passed through (1) a heated glass tube, G, containing copper gauze, to remove oxygen; (2) a spiral, H, containing an alkaline solution of pyrogallol, to remove the last traces of oxygen; (3) a spiral, J, containing concentrated sulphuric acid; (4) a U-tube, K, containing calcium chloride, to remove moisture. The nitrogen thus purified passes through the T-tube into the porcelain tube, E, as shown in fig. 1.

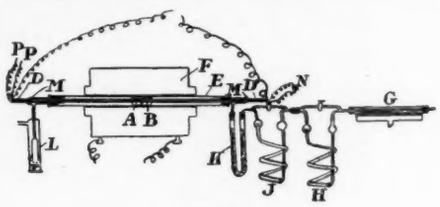


Fig. 1.

Fig. 2.

Fig. 3.

The nitrogen and volatile products of distillation leave the porcelain tube through the other T-tube, and then pass through sulphuric acid in the bottle L. The silica tubes, D, are passed through the boats A and B, being held in position relative to the boats by means of a little fireclay; and the thermocouples are threaded through the silica tubes. The two couples to be connected in opposition, so as to show the difference between the temperature of the coal and that of the coke, are arranged with their hot junctions at X and Y (fig. 2) in the centre of the coke and coal respectively. *Z* is the hot junction of the thermocouple which records the actual temperature of the coke standard. The coal is placed in the boat as described; and the boats and silica tubes are then placed inside the porcelain tube, so that the boats lie in the centre of the furnace. The corks and T-tubes are fitted to the porcelain tube, and the joints between the T-tubes and the silica tubes, D, are made gas-tight by means of wax at MM. The two platinum leads of the thermocouples, X and Y, are joined together at N, and the two platinum-rhodium leads, P, are joined by copper leads direct to the differential galvanometer. The junctions with the copper leads are made under water in a bottle well protected with cotton wool, so as to maintain both junctions at the same temperature. The two leads from the thermocouple *Z* were connected through a cold junction maintained at 16° to the Carpenter-Stansfield potentiometer, by means of which the actual temperature of the coke was measured. The most suitable rate at which to raise the temperature of the coke was found to be 7° per minute. Further experimental details, precautions, and necessary preliminaries will be found in the paper to which reference has already been made. The method of plotting the differential heating curve is the same as that often employed in metallurgical work. Deflections to the left indicate that the coal under examination is being raised in temperature more slowly than the coke standard, and *vice versâ*. It was shown that the varying heat conductivity of the coal undergoing distillation did not materially affect the curves obtained; and it seemed to us to be established satisfactorily that deflections to the left indicated a preponderance of endothermic reactions, and deflections to the right exothermic reactions. We do not attach any importance to deflections at temperatures lower than 200°.

After obtaining the heating curve of coal against a coke standard, a correction—obtained by heating the coke formed in the experiment against the same coke standard—was always applied. The validity of this correction has been repeatedly tested by reversing the position of coal and standard. The corrected curve (which alone is reproduced) represents the changes in the passage from coal to coke.

From a succession of experiments, heating curves were obtained for cellulose, dehydrated cellulose, lignite, and different types of coal. The percentage compositions of these materials are given in the following table:

	Volatile matter.*	Ash.	Ash-Free Substance. C.	H.	O.	S.	N.
Anthracite, Ystradgynlais .	5·97	2·12	89·20	4·31	3·91	1·34	1·25
Bituminous, New Hucknell	37·30	3·77	80·39	5·88	10·63	1·71	1·39
Cannel, Brodsworth. . .	45·27	4·80	80·79	5·46	10·60	1·21	1·94
Lignite, Bovey Tracey . .	65·00	5·20	63·00	6·26	28·58	1·66	0·50
Dehydrated cellulose . .	65·20	1·13	58·11	4·11	36·68	1·10	—
Cotton wool (theoretical composition)	—	—	44·4	6·2	49·4	—	—

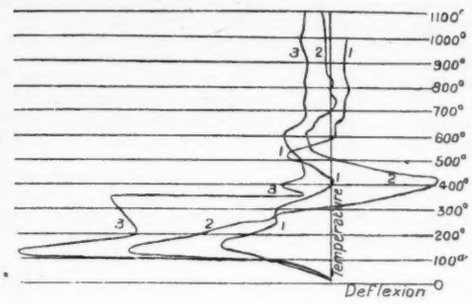
* Determined in platinum crucible by the 1899 method of the American Chemical Society.

* See "Journal of Gas Lighting" (1914), Vol. CXXVI., p. 917.

† Euchène, International Gas Congress, Paris (1900), see "Journal of Gas Lighting," Vol. LXXVI., pp. 1080, 1141; and Barnum, "Proceedings of the New England Association of Gas Engineers," 1906, p. 58; also "American Gaslight Journal" (1906), Vol. LXXXIV., p. 575.

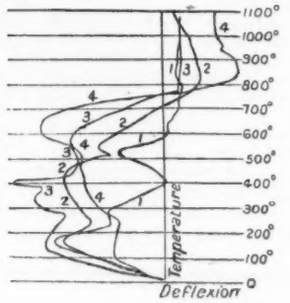
‡ Mahler, "Comptes Rendus" (1891), Vol. CXIII., p. 862; and Constam, Kolbe, and Schlapfer, "Journal of Gas Lighting," (1908), Vol. CIII., p. 382, (1909), Vol. CVII., p. 696.

§ "Proceedings of the Mechanical Engineers," 1899, p. 38.



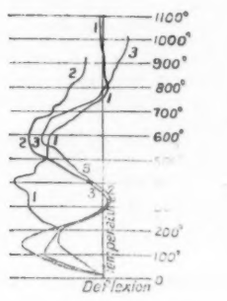
No. 1. Lignite. No. 2. Dehydrated Cellulose.
No 3. Cellulose.

Fig. 4.



No. 1. Lignite. No. 2. Cannel.
No. 3. Bituminous. No. 4. Anthracite.

Fig. 5.



No. 1. Original Coal. No. 2. Pyridine Extract. No. 3. Pyridine Residue.

Fig. 6.

The examination of cellulose was of interest in view of the origin of coal. That its distillation is exothermic has been widely noted* although Chorley and Ramsey† claimed that, with "medicated cotton wool," they obtained no evidence of exothermic change, and therefore they attributed the thermal effect to some impurity which could be removed from the wool. This we do not confirm; since the purest wool we could obtain, distilled in a similar manner to the coals, showed a very marked evolution of heat at 345°. We obtained the same result for high-grade, ash-less filter paper.

The dehydrated cellulose was prepared by the action of concentrated sulphuric acid on cotton wool at 70°‡.

The black substance formed thereby was washed repeatedly, to remove excess of sulphuric acid. This very slow process was quickened in the later stages by the use of ammonium carbonate solution. It will be seen from the analysis that the amount of sulphur was thereby reduced to 1 per cent. Moisture and absorbed ammonium carbonate were removed by drying at 110°. The empirical formula of dehydrated cellulose is $C_{6\cdot00}H_{5\cdot09}O_{2\cdot84}$.

The heating curves of cellulose, dehydrated cellulose, and lignite are plotted for comparison in fig. 4. In the case of pure cellulose, the evolution of heat is very sudden, and appears to be due to chemical action at a definite temperature—namely, 345°. In the case of dehydrated cellulose and lignite, the evolution of heat is spread over a wider range of temperature (280° to 420°), and is probably due to a series of decompositions. We may point out here that in no case have we found a sudden decomposition of coal similar to the exothermic decomposition of cellulose, which is presumably connected with the expulsion of the hydroxyl groups, and consequent molecular condensation, in the residue. The commencement of the exothermic stage in the curve for dehydrated cellulose is already uncertain, although in the curve for another sample, the commencement of exothermic distillation was better defined at 280°. The exothermic decomposition of lignite begins at the same temperature, but is very much less marked than that of cellulose. In the case of coals (fig. 5) in which, presumably, the degradation of cellulose has proceeded further still, there is practically no evidence of exothermic reactions below 400°. The comparison of curves for different types of coal—including anthracite—indicates that, in general, the thermal changes at low temperatures are characteristic of the coals in which degradation of cellulose is least complete. The most marked feature of the curves obtained for anthracite is the exothermic stage between 650° and 840°. The curves show that in the more oxygenated coals, this phase, though always very marked, falls away in relative importance, and occurs between somewhat lower limits of temperature.

One other feature in the curves which should be noted is the sharp absorption of heat in the case of the cannel coal between 510° and 550°. With the lignite this is more pronounced, and occurs between wider limits of temperature. The deflection is not so marked in the curves obtained for bituminous coal; but there is always a break in the evolution of heat in the neighbourhood of 500°. It may be connected with the distillation of oils. In the case of another bituminous coal (Monckton) Main), the various stages in the curve have been examined in some detail,§ and experiments carried out to confirm the interpretations placed upon the galvanometer deflections. It will be seen from a comparison of the whole of the curves obtained that thermal phenomena in the distillation of cellulose and of coals in which the degradation of cellulose is incomplete and the oxygen content high are of most importance at low temperatures. This is consistent with the view that the thermal phenomena at low temperatures are due to the decomposition of a series of oxygenated compounds, at the beginning of which stands cellulose itself. Experiments were carried out with ceresine wax of the composition $C_{26}H_{54}$. Experimental difficulties, due to the low melting point of the substance, made the results indecisive; but, so far as they went, they showed an absence of marked thermal phenomena at low temperatures, as would be anticipated if the above hypothesis is correct. At higher temperatures, thermal phenomena are most marked with coals of low oxygen content; and presumably these phenomena are due to such decompositions of the coal substance as result in the evolution of hydrogen and the gasification of carbon in combination with hydrogen as methane. When, as in the case of highly oxygenated coals, extensive decomposition takes place at low temperatures, much carbon is given off in gaseous compounds. The residue consists largely of fixed carbon, and only to a smaller extent of coal substances decomposable at higher temperatures. On the other hand, when the degradation of the cellulose, during the formation of the coal, has been more complete, it has produced a coal substance of low oxygen content, which is more stable at the low temperatures; hence in the case of such a coal the thermal phenomena are of greater relative importance when decomposition sets in at the higher temperatures.

We are greatly indebted to Dr. R. V. Wheeler for sending for examination samples of pyridine and pyridine-chloroform extracts and residues prepared from a bituminous coal (Beeston Seam), and for supplying the following analytical data:

	C.	H.	O.	S.	N.
Original coal	83·05	5·51	8·08	2 12	1·24
Pyridine extract . . .	83·11	6·06	5·96	3·89	0·98
Pyridine residue . . .	80·80	5·69	10·17	2·43	0·91
Chloroform extract . .	75·54	7·66	14·18	1·86	0·76
Chloroform residue . .	80·25	5·28	11·45	2·09	0·93

The heating curves of the original coal, the portion soluble in pyridine, and the portion insoluble in pyridine, are plotted for comparison in fig. 6. The curve obtained for the original coal is in general agreement with those obtained for other similar coals. We had conceived it possible that the characteristics of this curve might be traced to the portions of coal separated by extraction; but this has not proved to be the case. No thermal phenomena were noticeable with the pyridine-chloroform extract; but the same difficulty was experienced as with the ceresine wax. The absence of thermal phenomena at low temperatures in the case of this product containing a high percentage of oxygen may be explained by the fact that the analyses show that there has been marked oxidation during the isolation; and this oxygen may exist in a form different from the oxygen of the degradation products of cellulose. The only point in which there is any agreement between the curves for coal and those for the portions soluble and insoluble in pyridine is in the exothermic stage about 600°; and in all respects the curves for the portions soluble and insoluble in pyridine closely resemble one another. The observations support the view that a prolonged extraction of coal by means of pyridine effects partial decomposition, not simply preferential solution.

Summary and Conclusions.

If, in these experiments, the volatile products of carbonization accompanying each endothermic or exothermic stage, as thermally indicated, had been collected and examined, a useful chemical and thermal correlation might have been effected. That we are hoping to do, at any rate, for one or two typical coals. There are some chemical data already available for the purpose. Vignon* carried out a fractional distillation of coal between certain intervals of temperature—taking about the same time for a distillation as we took in our experiments. Comparison of our results with those obtained by Vignon, Wheeler, and his collaborators, and Pictet and Bouvier † would suggest the following correlation of themical and thermal stages in carbonization.

(1) *Below* 400°.—Cellulose shows a strong exothermic reaction, commencing at 345°; but this is very much weakened in dehydrated cellulose and in lignite, and absent in the coals. It is

* Bantlin, "Journal für Gasbeleuchtung" (1914), Vol. LVII., pp. 32, 55. Buttner and Wislicenus, "Journal prac. Chemie" (1909) Vol. LXXIX, p. 177. Klason, Heidenstam, and Norlin, "Arkiv. Kem. Min. Geol." (1908), Vol. III., No. 10.

† "Journal of the Society of Chemical Industry" (1912), Vol. XI., p. 872.

‡ Cross and Bevan, "British Association Report, 1881, p. 603. "Philosophical Magazine (1882), Vol. XIII., p. 327.

§ "Journal of Gas Lighting (1914), Vol. CXXVI., p. 922.

* "Comptes Rendus" (1912), Vol. CLV., p. 1514. † *Ibid* (1913), Vol. CLVII., p. 779.

presumably connected with the loss of hydroxyl groups, and consequent molecular condensation, in the residue.

(2) *Between* 400° *and* 600°.—In this interval, the characteristic differences of the types of coal are manifested. Oils, unsaturated hydrocarbons, higher paraffins, and oxygenated compounds are produced in quantity and quality dependent on the nature of the coal; and the thermal phenomena are varied in a corresponding degree.

(3) *Between* 600° *and* 800°.—In this interval methane is evolved, and all the coals display marked exothermicity in passing through it. If the carbonization of coal is on the whole exothermic, as is generally supposed, it seems likely that the principal factor in determining the exothermicity is operative in this interval, and that the main reaction responsible is the exothermetic production of methane. This conclusion is supported by thermal calculation applied to hypothetical chemical equations for the carbonization of coal with and without the formation of methane.

(4) *Above* 800°.—As clearly indicated by the experiments of Burgess and Wheeler, and confirmed by Vignon, hydrogen becomes the main product of distillation above 800°. The thermal change is equally marked around the same temperature. Above 800°, the process is either thermally neutral or, more probably, slightly endothermic—presumably because the reactions producing hydrogen are themselves of that character.

(5) Thermal phenomena at low temperatures are only marked with cellulose and coals of a high oxygen content, while phenomena at high temperatures are most marked with anthracite and coals of a low oxygen content.

EASTERN COUNTIES GAS MANAGERS' ASSOCIATION.

A Formal Meeting in London.

WHEN the announcement was made, it was felt that the Committee of the Association were wise, in the abnormal prevailing circumstances, in deciding to postpone until the spring of next year the general meeting usually held in the autumn, and to convene at the present juncture merely a gathering for the transaction of routine business. This took place in London last Thursday, when a fair number of members assembled to listen to some remarks by the retiring President (Mr. W. B. Farquhar, of Ilford), to welcome to the chair the new President (Mr. A. E. Broadberry, of Tottenham), and to pass several resolutions pertaining to the work of the Association.

The meeting was held in the Hertford Room, at the Liverpool Street Hotel; the chair being taken at the opening of the proceedings by Mr. W. B. FARQUHAR, of Ilford, the outgoing President.

MINUTES OF THE LAST MEETING—APOLOGIES.

The HON. SECRETARY (Mr. F. M. Paternoster, of Felixstowe) read the minutes of the last meeting; and they were confirmed. He then announced that a letter had been received from Mr. Thomas Goulden, the Chief Engineer of the Gas Light and Coke Company, which was in the following terms: "I very much regret that it will be quite out of the question for me to attend the meeting on Thursday afternoon, as my Directors hold their Committee meeting on that day. Will you kindly express my regret to the members present at the meeting that I am unable to be with them." Communications regretting inability to be present were also to hand from Mr. J. W. Auchterlonie, of Cambridge, and Mr. Joseph Hawksley, of Lowestoft.

NEW MEMBER.

On the proposition of Mr. G. R. CASTERTON (Melton Mowbray) seconded by Mr. J. BARTON (Peterborough), Mr. Cecil J. Robinson, the Manager of the Spalding Gas-Works, was elected as a member of the Association.

THE ASSOCIATION AND THE INDUSTRY.

Mr. FARQUHAR remarked that, in calling the members together for the meeting that day, he personally regretted that the conditions prevailing at the present time had made it necessary to postpone the usual full meeting, and to hold only a meeting to conduct the ordinary routine business of the Association. It was, of course, unnecessary for him to detail the reasons for such a step, as the members were all well aware of them. The Eastern Counties Association was affected, he thought, to a greater extent than any other in the country; and the Committee considered that it would be risking the possibility of a very small attendance, and the making of the full meeting somewhat of a non-success, if it was attempted to carry out a complete programme—particularly if it meant members staying in town over-night. It was also felt that with the uncertainty of members attending, it would be difficult to arrange for a suitable luncheon at which all could sit down together. They might have got an intimation that members would be present; but there was always the possibility of raids of a certain character over the Eastern Counties, and if one of these had occurred just previous to the meeting it would have meant that many members promising to come would have had to cancel the engagement. This might have landed the Committee in the uncomfortable position of having provided for fifty or sixty when only (say) thirty might attend. There was also another point—the address of the new President would in ordinary circumstances have been given at this meeting. But he was sure they would agree with him that the address which they might expect from a gentleman of Mr. Broadberry's calibre would in that case have been entirely lost. It would not be fair to him, unless they were quite sure of having a full meeting. The news of the past few days with regard to the war had certainly been very encouraging; and they all trusted it might prove to be the beginning of the end, in which case they might well hope that by the spring—when the time for the next meeting came round—they would be able to formulate arrangements for a good gathering. He could only repeat that personally, as their President, he regretted that circumstances had not enabled him to meet with the members at full meetings. But they must take the conditions as they found them; and although only one regular meeting had been held, the members could rest assured that the Committee had carried out the various duties incidental to the Association during the past year. He might also state that the Committee had a few extra duties to perform, in connection with the conditions which all were living under at the present time. It might not be considered out of place to make a few remarks now with regard to the industry, and the effect of the war upon it. They, of course, had been hit, the same as other industrial concerns; but they were, for their part, doing their best to meet these conditions, and there appeared to be every likelihood of them weathering the storm and coming out successfully in the long run. The industry as a whole was playing a very important and prominent part at the present time in the supply of various things necessary for the country's needs. The Government fully realized the fact that the gas-works were important in this sense; but he felt the general public were not fully aware of the real importance of the position that the gas industry was in at the present time in assisting the Government. ["Hear, hear."] The public, unfortunately, resented a gas company putting up the price of their article, more than they did in the case of the general dealer. They were quite content to pay increased prices for household necessities; but when a company raised the price of gas, it was almost thought they were robbing the consumer. It was therefore a pity that the public could not be brought to realize that the gas companies and corporations were really doing extraordinary service. There were a large number of gas undertakings at the present time turning out by-products for munition purposes. Some works, unfortunately, were not in the position to carry out the full programme of requirements just at the moment; but steps were being taken to get the necessary new plant and alterations to existing plant made, so that they could do their full share. These remarks were merely incidental to the business; and he would now proceed to the next item on the *agenda*—the introduction of the new President.

THE NEW PRESIDENT.

Mr. FARQUHAR (continuing) said that, in asking Mr. Broadberry to take the presidential chair for the coming year, there was no need to introduce him to the members, as he was well known to all of them. He was the Engineer and Manager of one of the most prominent gas companies in London—a company who supplied gas at a very low price, and had works thoroughly up-to-date, which were a monument to the engineering skill and ability of the new President. ["Hear, hear."] He was sure Mr. Broadberry would be of great assistance to the Association; and the information he could impart to them would be listened to with the greatest respect, as coming from a gentleman well versed in everything pertaining to gas-works and gas management.

Mr. A. E. BROADBERRY (Tottenham), who was greeted with hearty applause, then took the chair, and said that, in the first place, he wanted to thank Mr. Farquhar for the very kind words he had spoken in introducing him to the members as their new President. He only hoped that he might deserve all the complimentary things that had been said. At any rate, he would do his best to deserve them. He also wished to thank the members for the hearty reception they had given him. It was a great compliment to him that so many should be present on this occasion, as the business was entirely formal. The attendance was also a compliment to the late President, Mr. Farquhar. Having welcomed him into office, the members gave him their support on his leaving the chair.

THE PAST-PRESIDENT'S MEDAL.

The PRESIDENT said his first duty was to present to Mr. Farquhar, on behalf of the members, the Past-President's Medal.

This had become quite a custom in the Eastern Counties Association; but it must not be considered that it was a mere formality—for it was not. It was an expression of appreciation on the part of the members of the good work that the President had done for the Association during the year; and in the case of Mr. Farquhar, he thought they would all agree that the duties had been carried out in an excellent manner, and under difficulties such as no previous President had had to face. [Applause.] The trying times through which they had been living during more than twelve months past must have created many difficulties for the President; and yet he had managed to carry on the affairs of the Association to the satisfaction of every member. He found time to prepare and read to them what was described correctly in the minutes as a most instructive and interesting address; and he had also prepared some remarks for this meeting, to take the place of the address which he (the speaker) would have delivered if times had been normal. On their behalf, therefore, he had very much pleasure in presenting the medal to Mr. Farquhar. He trusted he would live long to wear it, and that it would always remind him of the very great esteem in which the members of the Association had held him as their President.

Mr. FARQUHAR, in acknowledgment, assured the members that the medal would be one of his treasured possessions, and that it would always serve to keep in mind the year in which he occupied the chair. In a sense, there was really no need for such a token, because he should always look with pleasure on the time he had spent on the Committee, and also as President. He could only hope that he had really earned all the kind things Mr. Broadberry had said, and the good opinions of the members generally.

Representative on the Institution Council.

The PRESIDENT said they had now to elect a district representative on the Council of the Institution of Gas Engineers. It had been the custom, he believed, in the Association to elect as their representative the President for the year; but it so happened on this occasion that their President was already on the Council of the Institution, and therefore they would not be taking advantage of the opportunity of securing further representation if they were to elect him. In the circumstances, he thought the best thing would be to re-elect Mr. Farquhar as the Association's representative; and he proposed this.

Mr. J. H. TROUGHTON (Newmarket) seconded the resolution, and it was unanimously passed.

Place of Next Meeting.

The PRESIDENT said the next matter they had to consider was the place of the spring meeting. It was rather difficult at present to lay down anything very definite for this. His Directors hoped they would be given the opportunity of offering the Association hospitality in some form; and therefore it looked as though it would be desirable to hold the meeting in London. The Committee could, however, hardly decide now whether it should be a one or a two day meeting. A great deal must depend upon how matters progressed abroad. He sincerely hoped—though there did not seem to be much probability of it—that by the time of the meeting peace would have been reached, which would justify them in having a two-day meeting. But, whichever way it was, he was asked by his Directors to extend to the members of the Association an invitation to be their guests, either at luncheon or dinner, as might seem most suitable. In any case, if it was the wish of the members that the spring meeting should be held in London, he offered them a hearty welcome on behalf of his Directors.

Mr. J. DAVIS (Gravesend) said that, after the remaks made by the President, they could not do better than accept his suggestion, and leave the matter to the Committee to arrange.

This was agreed to.

Votes of Thanks.

Mr. BARTON, in proposing a vote of thanks to the President, Officers, and Committee of the Association for their services during the past year, said they had carried out their duties uncommonly well, under very trying conditions. He thought they had done the right thing that day in calling the members together to carry on the formal business of the Association.

Mr. CASTERTON having cordially seconded the proposition,

The PRESIDENT said that, in putting it to the meeting, he would like to add his word of praise of the way in which the Committee had done their share in carrying on the work of the Association; and he would particularly like to include the name of Mr. Davis, for his services as Hon. Secretary. Mr. Davis, as they all knew, always put his heart and soul into the work that he had to do; and much of the success of the Association had been due to the careful way he had arranged every part of the business.

The resolution was carried with applause.

Mr. DAVIS, in responding, remarked that if he had done anything to deserve what had been said, it was because he had received the hearty assistance of every member. He only hoped his successor would do a great deal better than he himself had even attempted to do. He relinquished the secretaryship with a good deal of regret in one way; but he felt sure the gentleman who was succeeding him would do all he possibly could to enhance the fortunes of the Association. He thanked them all heartily for the assistance he had always received, and for the good fellowship and good feeling he had met with ever since he had had the honour of being Secretary of the Association.

The proceedings then ended.

MEASUREMENT OF ILLUMINATION.

The last part it is intended to reproduce *verbatim* of the report issued during last month of the Departmental Committee on the Lighting of Factories and Workshops, is Appendix XVII., which is, to an extent, a supplement to the section of the report that appeared in the "JOURNAL" last week, pp. 706-7. It is as follows.

Explanations of the terms "illumination" and "surface brightness" have been given in the report; but it may be useful to consider briefly the methods by which they are measured.

The brightness of a surface, as has been shown, depends not only on the amount of its illumination, but also on the fraction of the incident light which it returns to the observer. This fraction is known as the "coefficient of reflection of the surface," and is often conveniently expressed as a percentage. It varies from about 90 per cent. in the case of very white materials to 2 or 3 per cent. for black velvet. A perfectly white surface would return 100 per cent. of the light that is incident on it; but no such ideal surface is known.

If the illumination at a certain surface is 10 foot-candles, and the surface has a coefficient of reflection of 50 per cent. (thus returning only half the light it receives), it will only appear as bright as a perfectly white surface illuminated to half the extent—*viz.*, to 5 foot-candles. It is often useful in this way to express the surface brightness of an object in terms of the illumination required at a perfectly white surface to make the brightness of the latter equal to that of the object in question.

Example: A piece of grey cloth has a coefficient of reflection of 20 per cent., and is illuminated to 5 foot-candles. Its surface brightness would be matched by a perfectly white surface illuminated to $5 \times \frac{20 \text{ per cent.}}{100 \text{ per cent.}} = 1$ foot-candle.

The equivalent surface brightness of grey cloth under these conditions is thus said to be 1 foot-candle.

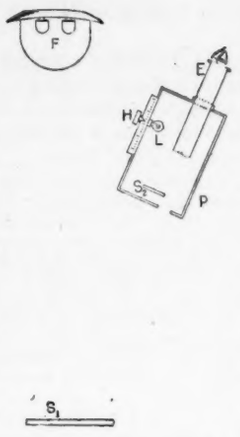
It is here assumed, for the sake of simplicity, that at a given illumination a surface has the same brightness whatever be the direction from which it is viewed, or whatever be the direction of the incident light. It is obvious that in the case (for instance) of a mirror, this will not be true. If a beam of light coming from a definite direction (*e.g.*, that given by a hole in a card placed in direct sunlight) falls upon a mirror surface, there is one particular direction along which the greater part of the light composing the beam is reflected; and so regular is the reflection that an observer sees an image of the hole as he looks towards the mirror from that direction. From any other direction, however, the mirror reflects practically no light whatever towards the observer—all the light having been sent off in the one direction. Such reflection, concentrated almost entirely in one direction, is called "regular" reflection. Supposing, now, a very "matt" (*i.e.*, unglazed) surface, such as a sheet of white blotting-paper, is put in the place of the mirror, and illuminated in the same way, no direction can be found in which the reflected light is much stronger than it is in any other direction. The blotting-paper looks equally bright from all positions, because its surface has the property of scattering the incident light and reflecting it in all directions. In this case the reflection is said to be "diffuse." Both the mirror and the blotting-paper reflect approximately the same amount of the total incident light (between 80 and 90 per cent.). That is to say, their coefficients of reflection are the same. But in the case of the mirror, the reflection is regular, while in that of the blotting-paper it is diffuse. The two cases considered are extreme; and most surfaces fall between the two—that is, a certain and usually the larger proportion of the light incident on them is diffusely reflected, the remainder being more or less concentrated in one direction. For very many of the substances dealt with, the proportion of regularly reflected light is small enough to introduce no serious practical error in ordinary measurements of surface brightness, although in such measurements the surface is always assumed to be completely diffusing. This assumption has been made with regard to the surfaces treated in this appendix.

Apparatus for Measuring Illumination—See p. 28.

Apparatus for measuring illumination consists, in its simplest form, of two identical white surfaces so arranged that they can be compared together. The first, S_1, is placed at the point where the illumination is to be measured, and receives on it all the light incident at that point; the second, S_2, is illuminated to any desired and known amount by some source of light under control. When the brightness of this second surface matches the first one, its illumination (being known) is a measure of the unknown illumination at surface 1. The various instruments used in practice merely differ in the methods adopted for adjusting the illumination at surface 2, and also in the devices employed for conveniently comparing the two surfaces together.

Arrangements are made within the instrument so that when looking through an eye-piece one portion of the field of view is occupied by a portion of surface S_2 of variable brightness, while the other portion is unobstructed. Then, by suitably directing the instrument, the surface S_1 may be seen filling the unoccupied portion of the field of view. The brightness of the variable surface S_2 is then adjusted, in this case by moving the lamp L towards or away from S_2, until the whole field of view appears equally bright. The illumination can then be at once read off on the scale.

P is the photometer case containing L the electric lamp, S_2 the surface whose brightness is varied by moving L, and E an eye-piece. S_1 is the other surface, placed at the point at which it is desired to measure the illumination produced by the lamp F. The surfaces S_1 and S_2 are observed simultaneously through E; and the handle H is moved until S_1 and S_2 appear equally bright. As the movement of the handle regulates the illumination at S_2, each position taken up by it corresponds with some definite illumination. These illuminations are marked on a scale over which moves a pointer attached to the handle; so that, when there is equality of brightness, the scale reading indicated by the pointer gives at once the desired value of the illumination at S_1.



If an operator wishes to know the illumination at the needle of a sewing machine, he has only to lay his white surface S_1 on the table of the machine against the needle, and direct his portable photometer towards it—adjusting his instrument until, as described above, equality of brightness exists over the field of view. The reading of the instrument then gives the illumination at the point on the sewing machine covered by the white card. Usually it is the illumination at a horizontal plane which is required to be known, because, as a rule, the object worked upon is approximately horizontal, or has to be viewed by the work-person from a point immediately above it. Cases, however, may arise—such as on a compositor's frame—in which the important plane is not horizontal but is appreciably inclined; and in this case the card may have to be placed at an angle. The illumination at a vertical plane is seldom required; but if, for instance, the illumination of picture galleries were under consideration, it is obvious the vertical plane would be more important than the horizontal one.

It will be seen from the foregoing description of a photometer that, although it is the brightnesses of the two surfaces S_1 and S_2 which are to be compared, yet, since they both have the same coefficient of reflection, the instrument can be and is scaled to measure illumination. It would be equally easy to scale the instrument to indicate equivalent surface brightness; but measurements of illumination are more often required than those of surface brightness. If an ideally white surface could be obtained for the surface S_1, the scales of illumination and equivalent surface brightness would be identical. A measurement of illumination at the white card, therefore, can be converted into a measurement of its equivalent surface brightness by multiplying the reading of the instrument by the coefficient of reflection of the white card.

> Example: If the illumination at the white card is measured as 1 foot-candle, and the coefficient of reflection of the white card is 0·85 (85 per cent.), the equivalent surface brightness of the white card at this illumination will be $1 \times 0{\cdot}85 = 0{\cdot}85$ foot-candle. Similarly, if the standard surface in the instrument be matched against the surface of any other material (such as a piece of cloth or wood), the equivalent surface brightness of such cloth or wood can be determined by multiplying the instrument reading by 0·85.

The coefficient of reflection of any surface is, of course, readily obtainable by measuring: (1) The illumination at such surface, and (2) its equivalent surface brightness under that illumination. The surface brightness divided by the illumination gives, at once, the coefficient of reflection.

The principle of the illumination photometer has been explained above in its simplest form. By adopting a suitable method of calibration, it is not necessary for the internal and external white surfaces to be identical, nor for the external surface to be detached from the instrument. These, however, are details of construction, and do not affect the main principle.

The variable brightness of the surface S_2 within the instrument is obtained in many ways in illumination photometers now in common use. Among these methods are the following:

(1) Changing the distance of the internal surface from the lamp illuminating it.

(2) Varying the intensity of the light from an electric lamp shining directly on the surface and contained within the instrument. This is effected by introducing into the lamp-circuit a resistance operated by a slider with a pointer attached.

(3) Changing the inclination of the surface to the rays from a lamp. The change in inclination is produced by turning a knob to which the pointer is attached.

(4) Using as the light source to illuminate the surface a greater or less area of another constantly illuminated surface. The area is changed by the movement of a shutter controlled by a handle with a pointer attached.

The material used for the white surfaces must be carefully chosen. No surface is obtainable which will return all the incident light; but in practice a material is chosen whose surface reflects as much of the light as possible. This surface must, as far as may be, fulfil the following conditions:

(1) It must be readily reproducible, in order to facilitate replacement without any necessity for readjustment of the instrument which has been calibrated by means of it. It will be observed that any change in the coefficient of reflection of the standard surfaces used with any given instrument would invalidate the readings of the instrument to the extent of the change.

(2) The surface must be as "matt" as possible, in order that it will appear equally bright whatever be the direction from which it is viewed.

(3) It must be white—that is to say, it must reflect in equal proportions all the light rays incident on it, whatever may be their colour.

A material often used for the purpose is opaque white celluloid prepared with a specially matt-surface. It is, as far as can be judged, quite white; and the surface can be made so matt that, over a considerable range of direction, the brightness remains sensibly the same. If it becomes soiled, the surface can, with a little care, be restored to its original condition.

COMPLAINTS AGAINST THE GOVERNMENT MINES IN GERMANY.

The following is a translation of an article in the "Vossische Zeitung" of the 27th ult.

We learn from the Town Hall that, while the Berlin Gas-Works have, for the last year, been doing their utmost to obtain the coal required to ensure an adequate supply of gas for Berlin, and a sufficient quantity of coke for the inhabitants, the Government mines have cancelled 30 per cent. of the quantity of coal sold to the gas-works, and have agreed to supply only half the quantity of coal they require. The result of this has been to compel the gas-works to buy in Moravia, Bohemia, and Poland coal which does not yield a suitable coke. Now there is a shortage of coke; and the inhabitants of Berlin are clamouring for this fuel. One would think the parties concerned would decide to supply sufficient coal to the Berlin Gas-Works; but far from it—the gas-works are bye-passed. The Prussian Government mines have recently issued an official notification that care will be taken to supply sufficient coke to the wholesale dealers in Berlin. It is quite untrue to say that only the Berlin Municipal gas-works are in such an awkward position as regards the supply of coke. A large number of German towns are in the same position. It would almost appear as if the situation resulting from the war were being taken advantage of to make the Municipal gas-works pay for having carbonized English as well as German coal for many years. It is quite wrong to assume that English coal alone was used on the Berlin works. This only took place in so far as it was necessary, in view of recognized commercial principles, and to safeguard the interests of the ratepayers in times of peace.

The Municipal gas-works have always readily acknowledged that German coal yields good coke. Westphalian and Lower Silesian coals, indeed, yield very hard coke. It is only when Upper Silesian coal is mixed with Austrian and Polish coal—which has lately had to be used owing to dire need, and which yields soft coke—that this Silesian coal does not yield good coke. Anyone acquainted with the present circumstances would conclude that it would be very greatly to the interests of the Prussian mines to assist gas-works in carrying on their business.

This is as far as the *communiqué* from the town hall goes. The attitude taken up by the Prussian mines is the more remarkable because, about nine months ago, at the instigation of the Government, the inhabitants of the city were earnestly requested to use coke for fuel. This well-considered appeal was made in the interests of the Fatherland. The bye-products from the gas-works play no unimportant part in the production of modern explosives. Large factories have, in consequence of this appeal, arranged their furnaces exclusively for coke; and in many private households this example has been followed as far as possible. Surely the Prussian mines will not, as a reward for meeting the Government's wishes in this respect, place all sorts of difficulties in the way of the Municipal gas-works.

It is not to be wondered at that, in circles which are hit most severely by the want of coke, extraordinary ideas are arising as to the reasons which led to the appeal to burn coke being made. In many communications addressed to us, correspondents openly express the opinion that the sole object of the appeal was to cause an artificial shortage of coke at the commencement of the autumn.

Rome and its Water Supply Fifty Years Ago.—In last Friday's "Builder" there was reproduced the following paragraph from their issue of Sept. 30, 1865: We mentioned some short time since the probability of the Aqua Marcia, celebrated in ancient times, being brought to Rome. We can now state that the concession was granted by the Roman Government on the 30th of August last, to Mr. Shepherd, the *gérent* of the Roman Gas Company, in conjunction with Mr. Henry Fawcett, of the Temple, London. We understand the enthusiasm in Rome on the subject will leave little to be done in London in establishing a Company.

NORTH OF ENGLAND GAS MANAGERS' ASSOCIATION.

Half-Yearly Meeting at Newcastle-on-Tyne.

THE Half-Yearly Meeting of the North of England Gas Managers' Association was held last Saturday afternoon in the lecture theatre of the Institute of Mining and Mechanical Engineers, Neville Hall, Neville Street, Newcastle-on-Tyne. Mr. THOMAS WADDOM, the Secretary of the Newcastle and Gateshead Gas Company, the President of the Association, was in the chair; and there was a large attendance of members. Previous to the meeting, the members visited the Elswick Gas-Works of the Newcastle and Gateshead Gas Company, and inspected the new plant, including the installation of vertical retorts—described on p. 20. The Engineer of the Company, Mr. Thomas Hardie, and other of the officials showed the visitors over the whole of the works. At the close of the tour of inspection, light refreshments were served. The meeting at Neville Hall commenced at two o'clock.

LETTERS OF REGRET.

The HON. SECRETARY (Mr. Herbert Lees, of Hexham) read letters of apology for absence from Mr. John Young, the President of the Institution of Gas Engineers, Mr. Drury, and other members of the Association.

AN ACKNOWLEDGMENT FROM MR. DOIG GIBB.

A letter was received from Mr. W. Doig Gibb, in acknowledgment of a resolution passed at a meeting of the Association in May last, expressing thanks for the kind message of the Association, and stating that it was pleasing to him to think that his old friends of the Association did not forget him.

LOSSES BY DEATH.

The PRESIDENT then referred to the loss which the Association had sustained within the last three weeks by the death of two of their oldest members—Mr. Thomas Bower, of West Hartlepool, and Mr. Joseph Hepworth, of Edinburgh. Mr. Bower became a member on April 26, 1884, and occupied the presidential chair in 1888-9. He had served on the Committee on several occasions, and during the 31 years of his membership was one of the most regular and valued contributors to the proceedings of the Association, either by paper or discussion. They mourned his calm presence, sound judgment, and quiet humour. Mr. Hepworth became a member on April 10, 1877, and was elected the Association's first Vice-President, and occupied the position of President in the succeeding year. In the early days of the Association he rendered very valuable service; and during his 38 years' membership his broad experience was always available for the welfare of the Association. The President said it was fitting the meeting should pass resolutions of sympathy with the families who were now in mourning. These resolutions would, he thought, be of some consolation to the families of the deceased gentlemen, and would convey to them the great respect in which the deceased members were held by those who had been closely associated with them in their professional capacity. He moved the following resolution:

> That this meeting records with deep regret the death of Mr. Thomas Bower, who for the past 31 years was a member of the Association, during the whole of which time he took keen interest in the work of the Association, filled the office of President in the year 1888-9, was a member of the Committee for several periods, and frequently contributed to its proceedings, and thereby rendered most valuable service to the Association; that this resolution be communicated to Mrs. Bower with an expression of sincere sympathy.

Mr. W. HARDIE (Tynemouth), in seconding, said Mr. Bower was a personal friend of a great many of them, and they all realized the loss they had sustained. It was a great sorrow to him, on returning from a holiday, to learn that Mr. Bower had passed to the majority.

The resolution was carried in silence.

The PRESIDENT then moved:

> That this meeting records with deep regret the death of Mr. Joseph Hepworth, who was one of the founders of the Association and its second President, filling that office in the year 1878-9. During the earlier years of the Association's history he was one of its most active members. He served on the Committee for several periods, and was a frequent contributor to its proceedings, and thereby rendered most valuable service to the Association; that this resolution be communicated to Mrs. Hepworth with an expression of sincere sympathy.

Mr. WILLIAM FORD (Stockton) seconded the resolution of condolence, and said he did so with great regret, as Mr. Hepworth was a personal friend of his. He was in Edinburgh a few days before Mr. Hepworth's death, and he was deeply sorry to be told that there was no hope for his recovery. When he returned to Stockton the next day, he found in the newspapers the record of Mr. Hepworth's death.

The motion was agreed to.

CONGRATULATIONS TO MR. J. H. PENNEY.

The PRESIDENT went on to say that he felt sure the Association would offer its very hearty congratulations to Mr. J. H. Penney, who had recently celebrated his jubilee with the South Shields Gas Company. He also was one of the founders of the Association. Mr. Penney became a member of their body in 1877, and was their first Auditor—a position which he held until 1895, when he was elected a Vice-President, becoming President in 1896-7. At the end of his presidential year, Mr. Penney succeeded the late Mr. William Hardie in the office of Hon. Secretary and Treasurer; and he discharged the duties of that office for five years. Mr. Penney did much useful work in connection with employers' liability insurance. The President said he felt sure it would be the wish of the members that the Secretary send to Mr. Penney a letter conveying their appreciation and congratulation. [Applause.] The President said there were only four of the early Presidents still with them—Mr. Penney, Mr. William Ford, of Stockton (who they were glad to see with them that afternoon, hale and hearty), Mr. Charles Potter (Chairman of the Walker and Wallsend Union Gas Company), and Mr. J. T. Jolliffe, then of Sunderland, now of Ipswich. Mr. Waddom mentioned that there were also among the original members Mr. James Whyte, of Seaham Harbour, Mr. Tobey, of Malton, and Mr. Richley, of Shotley Bridge.

NEW MEMBERS AND ASSOCIATES.

The following new members and associates were elected:

Members.—Mr. Frank Herbert Robinson, Harrogate Gas Company. Mr. Ernest Mills Archbold, Alnmouth Gas-Works. Mr. A. Phillip Allan, Scarborough. Mr. Harold Parks Allison, Yarm-on-Tees Gas Company.

Associates.—Mr. Stanley Sadler, Middlesbrough. Mr. Hubert Dunbarand, Hartlepool Gas and Water Company.

The PRESIDENT then delivered the following

PRESIDENTIAL ADDRESS.

Gentlemen,—I thank you most sincerely for the honour you conferred upon me eighteen months ago in electing me to the presidency of this Association, and, again, last May, re-electing me, in consequence of the exceptional circumstances preventing the usual meeting being held last October, when, in the ordinary course of events, the Presidential Address would have been delivered. It was hoped, when the decision to abandon the October meeting was made, we might be in a position to meet this year under happier conditions; but, alas, the hope has not been realized. I assure you that I appreciate the honour of being your President, and only regret we meet to-day under the shadow of a cloud which darkens the whole of Europe—I may almost say the whole world.

THE WAR.

Our nation is at war, and such a war as has no parallel in the history of the world. Practically the whole of Europe is under arms if not in actual conflict. We have drawn the sword to vindicate the right of nations to exist peaceably, free from the thraldom of another nation which has, unprovokedly and after deliberate preparation extending over many years, plunged Europe into a war with the avowed object of establishing for itself an absolute world-power—such war to be prosecuted by means of a system of militarism, barbarism, and terror in which the principle of might and not right is the basis. Could it, in these circumstances, be doubted that the nations sought to be conquered would take up the sword in the cause of all they hold most dear—their hearths and homes and the ideals of justice and equity as between nations great or small? No! there was no hesitation. The challenge was accepted, nation joined nation, and our dependencies rushed to the support of the Mother Country. Our Prime Minister declared that the sword would not be sheathed till the aggressions against Belgium and France were redressed and the rights of the smaller nationalities of Europe were placed on an unassailable foundation, and until the military domination of Prussia was wholly and finally destroyed. So also declared our Allies. Such is the unanimous resolve of the peoples of this nation and the allies with whom we are associated, however long it may take to end the titanic struggle; and may God in His mercy give us the victory soon.

EFFECT OF THE WAR ON THE GAS INDUSTRY.

The gas industry has necessarily, in common with other industries, been subject to much disturbance in consequence of the war—some gas undertakings more than others; but to all the work of fulfilling duties to consumers, shareholders, committees, and directors has been rendered exceedingly difficult. With crippled resources in labour and material, the gas-works are being efficiently

carried on, even where the requirements of the consumers have been very largely increased. With coal and other material very dear, and difficult in some instances to obtain at any price; with the price of gas to consumers raised; and dividends and aids to rates reduced—all have been loyally and patriotically borne for the good of the cause whatever sacrifice was involved.

As an instance of how an undertaking has been affected by the enlistment of a number of its employees, and others leaving for munition work, while at the same time called upon to supply a large increase of gas, the following statement of the Newcastle Company's experience may be interesting:—

Number of Employees.

	Elswick.	Redheugh.	Distribution.	Offices. Male.	Offices. Female.	Total.
Maximum (Winter)—						
1913-14	189	765	800	158	4	1916
1914-15	219	769	735	142	17	1882
1915-16 (estimated)	250	769	450	129	25	1623
Employed in September—						
1913	163	570	758	158	4	1653
1914	147	604	704	142	17	1614
1915	211	571	433	129	25	1369
Short of maximum	39	198	367	29	21 (plus)	612
Left during war (Males only) for:						
Enlistment—						
Regular employees	32	187	131	43	..	393
Temporary ,,	5	30	1	..	..	36
	37	217	132	43	..	429
Munition work	..	8	182	..	..	190
Other reasons	29	5	16	5	..	55
	66	230	330	48	..	674
Taken on during war	26	190	49	24*	..	289
Net depletion	40	40	281	24	..	385

* Practically all youths.

Make of Gas and Men Employed at the Gas-Works.

(Two first weeks in September.)

		Thousands. Cubic Feet.	Men Employed.
1913 ..	First week ..	57,525	733
	Second week ..	62,768	
1914 ..	First week ..	61,439	751
	Second week ..	62,222	
1915 ..	First week ..	64,812	782
	Second week ..	66,421	

(Winter make—October to March.)

	Thousands. Cubic Feet.	Men Employed.
1913-14	2,313,232	954
1914-15	2,573,055	988
1915-16 estimated 5 per cent. above 1914-15	2,701,705	1019 (estimated requirements)

The difference between men now employed (782) and the maximum requirements for the coming winter (1019) is thus 237.

It will be observed that, so far as the gas-works are concerned, the difficulty will increase as the winter reaches the maximum requirements. I therefore trust that the Government will, in whatever measures they may take to obtain men for the vigorous prosecution of the war, recognize the essential character of the work that is being done by gas undertakings.

Of the decrease in the number of men in the Distribution Department, 98 is due to the non-lighting of the public lamps since April last, and the remainder to the very proper decision of the Directors to comply with the strong appeals of the Government not to hinder men as far as practicable from enlisting or working on munitions.

The only department in which material reductions in labour could be carried out without jeopardizing the supply of gas was the distribution—by curtailing the supply of new appliances other than those necessary for the requirements of the war. This decision took effect from the beginning of July last—notices being posted in the offices and show-rooms; and I am pleased to say the public have most patriotically co-operated with the Company in postponing the fixing of appliances.

We are all proud of the patriotism of the employees of our respective undertakings who have volunteered to join the Colours, and, if need be, to lay down their lives for the sake of our country. And we are glad that employers have seen fit to show their gratitude and appreciation by making generous provision for the dependants of our brave fellows and guaranteeing work for them when they return. I am sure that I express your feelings in this respect, and also in wishing them God-speed and a safe return to their homes and work.

EXPORT RESTRICTION AND BYE-PRODUCTS.

Exports of residuals have been much interrupted by the war and the necessary regulations of the Government as to licences, which fall more heavily upon statutory gas manufacturers than others with greater freedom as to production. Gas must be made to meet the requirements of those who consume it, including those to whom it is essential for the manufacture of munitions of war; and the bye-products must be disposed of by exportation where the quantity made exceeds the requirements of the district. The question of export applies more particularly to coke and sulphate of ammonia; and it is to be hoped that the difficult conditions to which I refer will be fairly recognized by the Exports Committee in granting or refusing licences. It was for some considerable time from the commencement of the war practically impossible to dispose of pitch, owing to the effect of the war in France and Belgium, to which countries it has hitherto generally been exported; but matters in this respect have fortunately become somewhat easier.

INCREASES IN THE PRICE OF GAS.

The whole of the bye-products of gas-works had by the end of the year 1914 declined in value; and this, combined with the increased cost of coal and all other materials and charges, made it imperative, with few exceptions, to increase the price of gas—always a disagreeable duty for both municipal committees and company directors. The increases in the North-Eastern district range from 2d. to 8d. per 1000 cubic feet.

COAL.

The increased price of coal has perhaps, in the majority of gas undertakings, been the most serious difficulty with which their administrations have had to contend. Fortunately, twelve months supplies had been purchased generally before the outbreak of war; but the trouble arose in the early months of the present year when a coal boom commenced, and all purchases for delivery during the following twelve months were subject more or less to its effect. Durham coal—which could have been purchased in January last for prompt delivery at about 11s. per ton f.o.b. Tyne—was towards the end of February most difficult to obtain, owing to the abnormal demands from other countries. Prices soared rapidly, until ultimately they reached the staggering altitude of 27s. per ton in the month of April, with every appearance of rising higher. The prospect for the future to all large consumers of coal was so serious that a conference of about 600 representatives of gas, electricity, and other undertakings was held in London, in May, to consider what steps should be taken to meet the situation; for most gas undertakings had already been obliged to raise the price of gas, and unless matters improved many would have to resort to further increases.

The conference appointed a strong deputation to lay the facts before members of Parliament, with the result that the Government were informed of the serious position of the undertakings; and they promptly took the first of two steps to alleviate the situation by the appointment of a Coal Export Committee, with powers to restrict all exports, by making it necessary to obtain licences before shipment to neutral countries. The effect of the operations of the Committee was soon apparent by the greater quantity of coal available for home consumption, and a consequent fall in prices. The Committee have since drawn the strings more tightly by a further regulation extending the requirement of licences for all coal exports to our Allies.

The second step was the passing of the Price of Coal (Limitation) Act, 1915, which received the Royal Assent on July 29, and thereupon came into operation, and will continue during the continuance of the war and for a period of six months thereafter. The effect of the Act briefly is that during the prescribed period the price of coal at the pit mouth (not being for exportation) shall not exceed the price at which such coal was sold under similar conditions on or near the corresponding date in the twelve months ended June 30, 1914, *plus* the sum of 4s. per ton. The Act contains a useful provision in favour of statutory gas and electricity undertakings with respect to contracts made between the 1st of April and the commencement of the Act at higher prices than the maximum.

The first action of the Government therefore restricts the excessive shipment of coal abroad, which was the main factor in running-up prices; and the second provides, when a purchase of coal is desired, a method of fixing a maximum price based upon the actual prices of the twelve months ending June 30 in the year immediately preceding the war. So far the action of the Government has been beneficial to purchasers. Not only has the upward trend of prices been arrested, but they have been materially reduced. For this relief gas undertakings appreciate the action of the promoters of the weighty conference which moved the Government to take prompt action to relieve a most critical position for those bodies whose duty it is, under statutory compulsion, to supply the public with commodities of such general necessity to the nation as gas and electricity, and especially so during the war, when such supplies are increasingly important.

As to whether or not the measures of the Government will be sufficient for the full attainment of the objects in view, it is, of course, impossible to say with any certainty. I am, however, of opinion, that the operations of the Export Committee, properly carried out—as we may assume they will be—will result in the prevention of prices being abnormally inflated, as the control by the Committee over shipments abroad will, while providing for the necessities of our Allies, prevent neutral countries obtaining such quantities as would leave a shortage for home consumption; and the Coal Prices Act will also assist—at any rate, the purchasers know the worst. Prices cannot exceed the range existing during the basis twelve months, *plus* 4s., which represents the extra cost of the colliery due to the war; and how much lower coal may be obtained at depends upon the measure of the restrictions of the Coal Exports Committee. I would, however, add that we cannot

reasonably hope to obtain coal during the war period at peace period prices.

THE GAS INDUSTRY AND ITS ASSOCIATIONS.

It is a matter for congratulation that the gas industry of the country is in as vigorous a condition as it has ever been in the past. A few years ago, perhaps, this could not have been said. Serious competition was a new experience for us; and some time was needed to realize that this cannot be taken lying down without losing position in the battle, and that competition calls for more energetic effort upon the part of all those who desire to succeed. Gradually, however, competition has proved to be the necessary stimulus for arousing us to the need of greater and greater exertion. Organization was already existing, but required development. First in rank and length of days was the Association now known as the Institution; then the District Associations, which have provided further means for the discussion of the problems of the industry with the very important advantage of seeing them from a local point of view. I would here add that at the first meeting of our own Association (38 years ago) the first President—the late Mr. W. J. Warner—clearly recognized the importance of the business side of the gas undertakings; for he said, when referring to the future work of the newly-established Association: "The papers therefore of the commercial portion of our business should be as carefully prepared as the professional; and in their discussion there should be a deep sense of responsibility of our individual positions. Ours is not a private business, it must always be borne in mind, and also that the public have a pecuniary interest in our undertakings. It is a matter of regret, I think, that such Associations as ours were not established at an earlier period of our history, as they would have advanced our business, and, by the diffusion of information, have materially improved our relations with consumers individually and collectively." These words, uttered so long ago, will, I am sure, be endorsed by all our members to-day.

Next in order came the Commercial Sections, which might, in some instances, be more appropriately otherwise named; for matters other than "commercial" relating to gas-works management are also dealt with. The usefulness of these sections cannot easily be over-stated. The monthly meetings of the heads of the administrations of the undertakings of a district afford opportunities for the discussion of subjects with greater freedom than is the case in the more dignified meetings of the larger bodies, with generally so full an *agenda* that a new subject cannot easily be interpolated. Then there is the Society of British Gas Industries, which contributes so largely to the welfare of the industry by providing the latest and best in the way of plant and appliances for both the manufacture and use of gas. And, finally, the British Commercial Gas Association, brings practically the whole industry together through representatives from all the districts and from the Society of British Gas Industries.

The whole of these Associations afford opportunities for frequently conferring as to the multitudinous matters that concern the welfare of the industry in which they have a community of interests. This organization of the industry has brought about what I may call a new spirit among us—that of a greater willingness on the part of all to co-operate for the purpose of carrying out our obligations to our customers, the public, in such a manner as to render it the most efficient service within our power to give; for therein lies the secret of the success of the industry.

The Sulphate of Ammonia Association, although it does not come under the above enumeration of the various details of the organization of the gas industry, is nevertheless a body in which the gas industry is largely interested; and it is a very valuable Association for the purpose of enlarging the use of this fertilizer throughout the world by means of propaganda, and for assisting in the disposal of the largely increasing production thereof. Mr. A. G. Leighton, the Home Sales Manager of the Association, will to-day give us some information as to the efforts now being made to assist in the greater use of the article in the British Isles.

I think you will agree, therefore, that the industry we represent is fully equipped for the maintenance of the progress which it at present enjoys.

USES OF GAS.—VALUE OF SHOW-ROOMS.

Gas is used so extensively for purposes other than the original one when, a century ago, it first entered in the homes and business premises of the people as an illuminant, that it has almost literally laid successful claim to have "a thousand and one uses;" and these are increasing as the value of heat under perfect control is realized. That it is being so realized is demonstrated by the use of it during the present period of unexampled exertion in our industrial areas.

The consumption of gas continues to make steady and substantial progress, as the Board of Trade and other statistical returns bear ample witness. The introduction of vastly improved lamps and burners—more particularly the "Metro" introduced by the South Metropolitan Gas Company—has had a beneficial effect in increasing the use of gas for lighting; and the hiring of cookers, fires, and water-heaters has also greatly increased its use. This is, of course, very satisfactory; but for the gas undertakings that supply areas in which there are industrial manufactories, there is very fruitful field for the introduction of gas-heated furnaces and other appliances, where heat under perfect control is essential and can be provided by gas economically. In such districts it is very desirable to provide a well-fitted industrial show-room for giving practical demonstrations. A conservative estimate, made a short while ago, showed that about 750 million cubic feet was then used in the Newcastle Company's area for industrial purposes (including about 500 gas-engines, but not the lighting of factories), or nearly a quarter of the total consumption. This will be more at the present date.

The price charged for gas for industrial purposes (other than that used in gas-engines which is subject to a discount of 25 per cent.) is the same as for other purposes, and subject to the same scale of discounts—viz.:

Consumption per Quarter.	Discount.	Net Price, with Gas at 2s 3d. per 1000 Cubic Feet.
	Per Cent.	s. d.
000 to 100,000 cubic feet. . .	10 ..	2 0·3
100,000 to 250,000 cubic feet. . .	12½ ..	1 11·625
250,000 to 400,000 cubic feet . . .	15 ..	1 10·95
400,000 to 1 million cubic feet . .	17½ ..	1 10·275
1 million to 15 million cubic feet .	20 ..	1 9·6
15 millions to 80 million cubic feet.	22½ ..	1 8·925
80 millions upwards cubic feet . .	25 ..	1 8·25

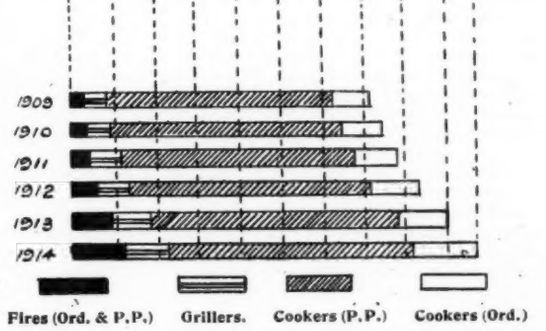
The question of a differential price for furnaces and such like appliances is one that presents some difficulty in drawing a line as to classes of consumption; but it is one of those matters which will need to be determined "after the war." The use of industrial appliances undoubtedly favourably affects the day as well as the summer consumption.

GROWTH OF DOMESTIC GAS APPLIANCES.

The following table shows the growth of the number of cookers, fires, &c., issued on loan during the past five years, which covers the period of the special efforts of the Newcastle Company to develop these portions of the business and the propaganda work of the British Commercial Gas Association.

	1909.	1910.	1911.	1912.	1913.	1914.
Cooking-stoves on loan—						
Ordinary . .	9,395	9,837	10,105	11,248	12,555	14,101
Prepayment .	53,450	55,390	56,956	57,948	59,133	59,961
Grillers on loan.	6,002	7,329	8,076	8,792	9,282	10,152
Gas-fires on loan—						
Ordinary . .	2,436	3,106	4,137	6,028	8,929	11,528
Prepayment .	86	107	150	266	393	493

The following shows these figures in diagrammatic form:

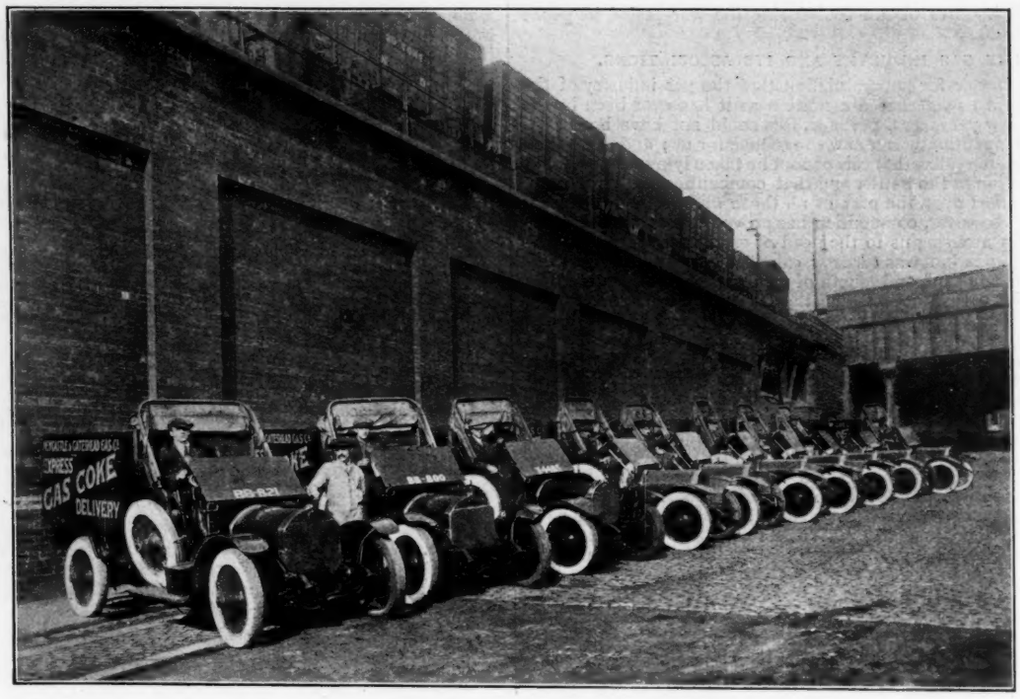


For the purpose of the development of the use of gas, the Company have three show-rooms—one in the same building as the chief offices, another in Northumberland Street [a good thoroughfare for the purpose], and the third in the adjoining borough of Gateshead. The Company's area is divided into four districts, each being in charge of a district representative (with one or more assistants) responsible for the conservation and development of business within his district; the whole of the Sales of Gas Department being under the superintendence of a competent chief. It is a system which works very satisfactorily.

COKE DISPOSAL.

The problem of the profitable disposal of coke has of late seriously grown in importance, owing to increased coal carbonization [and this notwithstanding the increased makes of gas per ton] and the greater production of coke per ton of coal carbonized. In addition to these causes, the rise in the price of oil has resulted in less oil gas being made throughout the country, and consequently leaving more coke to be disposed of. Stocks increased enormously early last year; but circumstances connected with the war have relieved the situation up to the present time. We may, however, anticipate that there will be an increasing necessity in the future for finding new outlets for this bye-product.

The difficulty being a national one, the finding of the remedy appears to be a suitable one for united effort; and appropriately the British Commercial Gas Association have taken the lead by forming a Coke Committee, and issuing a report upon the subject of the means for improving sales, and have also provided suitable literature and advertisements for publicity purposes. It remains for the undertakings to prosecute the work individually in their respective districts, in the manner most suitable to the conditions thereof; for naturally the conditions vary largely. Those in the North of England have, for instance, to take into consideration the close proximity to comparatively cheap coal. In some towns



EXPRESS COKE DELIVERY WAGGONS.

in this district the make of coke is larger than the towns can absorb at a reasonable price; others, again, are so geographically situated that they have an outlet, through ports within a reasonable distance, for the exportation of the surplus remaining after their own district has been supplied. I would say here that such surplus should not be dumped into a neighbouring district unless there is a shortage in that district, and then by arrangement with the undertaking of that area.

The Newcastle Company have for nearly half-a-century been obliged to export their surplus coke, and have, consequently, built up a connection for its disposal overseas. They have, however, been careful to avoid penalizing the home consumer thereby; the price charged to the latter being regulated by that charged by neighbouring undertakings. But whatever may be the conditions of a gas undertaking regarding outlets, its duty, and also its interest, appears to be in securing within its own area a steady and permanent business for coke to be consumed in the district.

The Directors of the Newcastle Company determined, in September last year, to make a further effort to increase the sale of coke for use within their area of supply; and during the twelve months just completed they have reason to be satisfied with its success, notwithstanding very serious interruption to sales during the last winter, due to the impossibility of delivering coke within many weeks of the receipt of orders, owing to the shortage of horses, carts, and drivers, and the commandeering of the motor coke waggons by the military authorities.

The following statement will show the comparison of the disposal of coke for the twelve months ended September, 1914 and 1915 respectively:—

Disposal of Saleable Coke

(Exclusive of used on works and breeze).

Twelve months ended September.

		1914.		1915.
Total saleable . . .		151,429		152,036
Used on carburetted water-gas plant . .		1,755 (1·1 p. ct.)		3,951 (2·6 p. ct.)
Land sale—				
Carted . .	27,254		34,402	
Rail . .	8,388		11,077	
Craf . .	1,934		1,012	
	37,576 (24·9 p. ct.)		46,491 (30·6 p. ct.)	
Exported	112,098 (74 p. ct.)		101,594 (68·8 p. ct.)	
	151,429		152,036	

Increase, 8915 tons (21·1 per cent.) on land sales.

POPULARIZING THE USE OF COKE.

The means adopted for popularizing the use of coke were briefly as follows:—

1.—Reduction in price from 16s. 8d. to 14s. 7d. per ton [this would have been reduced in any case to 15s.], broken coke 10d. extra. The latter does not cover the cost of breaking; but, by the introduction of new coke storage, grading, and screening plant at Elswick, the quantity necessary to put through the breaker is considerably reduced.

2.—Provision of a number of one-ton motor coke delivery waggons to expedite delivery.

3.—Enlarging the area of a uniform charge for delivery. The motors enabled this to be done.

4.—In addition to selling coke in 1 cwt. bags, the introduction of paper bags containing 28 lbs. This resulted in the sale of 80,975 bags, with an aggregate total weight of 1012 tons, and were distributed in certain districts by shopkeepers.

5.—Advertising by means of the press, posters, literature, and distribution of coke-order cards. This portion of the scheme has not been carried out as fully as was intended, owing to the difficulty as to deliveries of coke.

6.—Appointment of a representative to develop coke sales, the results of which so far have been exceedingly satisfactory. But here, again, the war has interfered with the work; for within a few months of his commencing duty he joined the Colours.

The promising measure of success gained I attribute mainly to the increase of facilities for supplying coke cheaply, expeditiously, and with the minimum of trouble to the consumer.

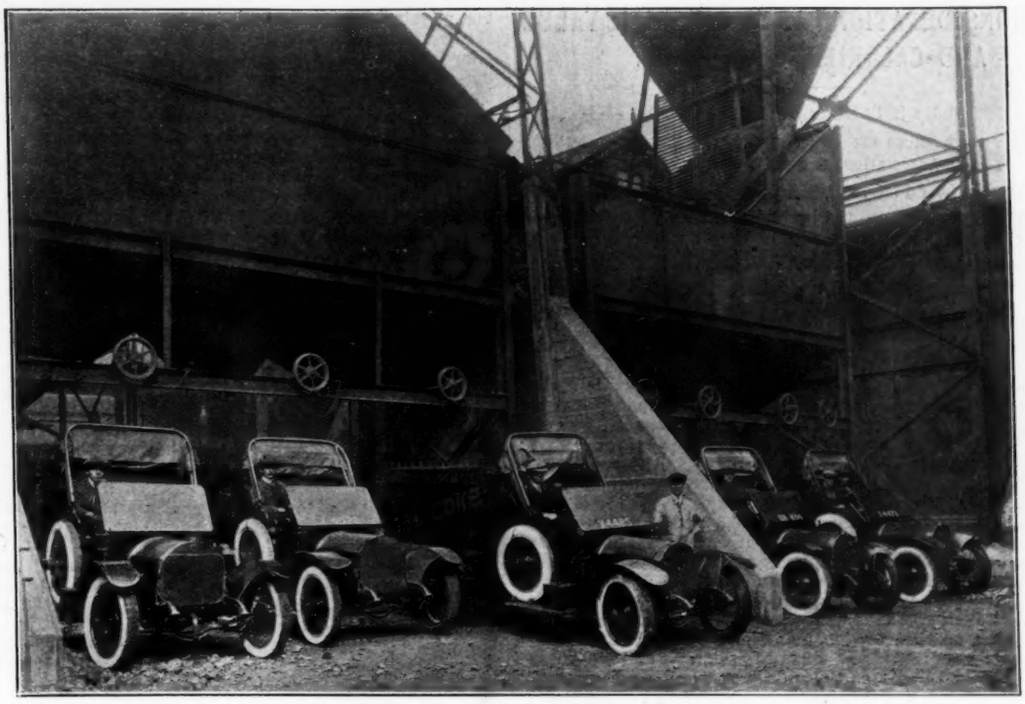
The number of express motor delivery waggons now employed in the delivery of coke is twelve. Ten of these are shown in the accompanying photographs, as is also a portion of the coke-handling plant, further particulars of which will be found in Mr. Hardie's interesting account of the partial reconstruction of the Elswick Gas-Works.* The usefulness of the "Express" waggons is most marked on the occasion of a sharp fall in temperature in winter, when the orders for coke arrive in large numbers. I am confident that their introduction has materially assisted us in the development of the sales of coke, and will continue to do so still more as the system is still further organized. The coke-waggons used for coke conveyance were made by Messrs. Sir W. G. Armstrong, Whitworth, and Co., and are 15/20 H.P. The chassis is of the Armstrong-Whitworth type, with worm gear and specially strengthened back axle. The body is made of pitch pine 6 ft. 6 in. by 6 ft. 8 in. by 2 ft. 9 in. deep, fitted with special tipping gear enabling the whole of the load to be discharged freely. The waggons carry 20 cwt. of coke easily, on pneumatic oversize tyres, 820 m.m. by 135 m.m. The average quantity of coke carried per waggon daily is 10 to 11 tons; and the average daily mileage is 40 to 50. But it is possible, under good conditions, to do 14 to 15 tons, and 60 to 70 miles per day.

THE "B.C.G.A."

The British Commercial Gas Association continues to command the support of the gas industry, as it deserves to do. As time passes it enlarges its activities for the benefit of all concerned in the production and distribution of gas—whether members of the Association or not—and will persevere in doing so until 100 per cent., and not 80 per cent., of the undertakings are subscribers.

Mr. W. DOIG GIBB moved a vote of thanks to the President for his address, which he said they had listened to with great interest. It was really very difficult to say anything new in presidential addresses, but he had been very glad to come North to hear the one they listened to that afternoon. Mr. Waddom was still the original man he had always been, and he had given them some-

* See *ante*, p. 20.



WAGGONS IN POSITION FOR LOADING.

thing that was quite out of the ordinary run of presidential addresses. It was the sort of address they might expect from Mr. Waddom; they had got something good. Mr. Waddom had done a great deal for the gas industry in the North of England, and he had long been connected with the Newcastle and Gateshead Gas Company. This connection had resulted in much of the success which attended the Company's operations to-day. He took a keen personal interest in the North of England Gas Managers' Association, and the interest he took in the gas industry nationally was evidenced by what he had done in connection with the advocacy of the claims of the British Commercial Gas Association.

Mr. M. FLIGG (Redcar) seconded, and said Mr. Waddom had given them a very good address, which would encourage them to further efforts on behalf of their respective gas undertakings. Mr. Waddom was always willing to give them the benefit of his long experience and knowledge of gas affairs. He had done splendid work in their Commercial Section. They always looked upon the Newcastle Company as the leading gas company in the North of England, and had admired its progressive policy.

The resolution was cordially agreed to.

The PRESIDENT briefly returned thanks. He assured them that what they had said was perfectly true; his heart and soul were in gas. His only regret was that the heart was not so strong as it was, for they must always remember the limitations which *Anno Domini* placed upon them. It had been a most difficult thing in addressing them to avoid repetition. There were a good many subjects he would like to have touched upon, but he found it necessary to keep a lot out; and what little merit the address possessed had been to him a labour of love.

CALORIFIC VALUE AND CALORIFIC STANDARDS.

Mr. J. T. Dunn, D.Sc., then read a paper on "Some Considerations as to the Calorific Values and Calorific Standards." This will be found, together with the discussion upon it, on p. 34.

HOME SALES OF SULPHATE OF AMMONIA.

Mr. A. G. Leighton, of the Sulphate of Ammonia Association, next read a paper on this subject. It was on the lines of that contributed by Mr. F. C. O. Speyer to the North British Association last month [see "JOURNAL" for Sept. 7, p. 512]. At its close,

The PRESIDENT said he thought they would be all pretty well in agreement with what Mr. Leighton had said. He might say he was. They could not do better than cultivate home sales. Example was better than precept; and his Company had for many years set the example. They had cultivated home sales until they had got a secure market. The local use of sulphate of ammonia was equal to almost a third of their entire make. It took more to sell it than giving it to a man to go abroad, but it was worth doing. The more they sold locally or in the home country, the better would be the price for export. They could not in this little country use all the sulphate of ammonia they made; and some, therefore, would have to go abroad. As to the terms for home sales, he certainly agreed to the equity of those proposed by Mr. Leighton. In proof of this, he might mention they were the same as his Company had used for the last ten or twelve years. It amounted to within a fraction of 10s. per ton.

VOTES OF THANKS.

Mr. R. NELSON (Hull) moved a vote of thanks to the readers of the papers and to Mr. T. Hardie for his description of the Elswick Gas-Works and to the Directors and Officials of the Newcastle and Gateshead Gas Company for their hospitality. He said it had been a privilege to them to see the work of reconstruction which was being carried out at Elswick, and to most of them the visit had been all too short. Given a convenient site, it was a comparatively easy matter to put down new works; but Mr. Hardie had been faced with the problem of demolishing old works and putting down new works in their place. He congratulated Mr. Hardie upon the reconstruction of the works, and thanked him for the opportunity of having seen and heard how the various difficulties had been overcome.

Mr. NORMAN S. COX (Sunderland) seconded the proposal, and said the papers had been most interesting.

The votes of thanks were warmly accorded.

Mr. DUNN, in reply, said the visit to the Elswick Gas-Works had been exceedingly interesting.

Mr. LEIGHTON, in responding, said he was very pleased to have had the opportunity of bringing the work of his Association before the members of the Association.

Mr. HARDIE also briefly returned thanks.

MEMBERS WITH THE FORCES.

The PRESIDENT said he would like to introduce a matter that was not on the *agenda*. The Association, as they knew, had a number of members and associates who were serving their country under the Colours, and some of them were at present in the fighting line. He suggested it would be an encouragement to those members if the meeting passed a resolution expressing appreciation of their patriotism. He therefore moved the following resolution:

> That this meeting records with gratitude and pride that many of the members and associates of the North of England Gas Managers' Association are serving their country patriotically in defence of the Empire, and expresses the sincere hope of all present that each and all of them may have good luck and a happy return to the North of England.

Mr. T. H. DUXBURY (South Shields) seconded the proposal, and it was agreed to.

The members and their friends were afterwards entertained to tea by the Newcastle and Gateshead Gas Company; and subsequently Sir Walter R. Plummer, the Deputy-Chairman of the Company, who was unfortunately late in arriving at the business meeting, owing to his train from Keswick being delayed, took the opportunity of welcoming the members on behalf of the Directors, and duly acknowledged the vote of thanks that had been passed earlier in the day.

Mr. G. J. Eveson, the Governing-Director and Founder of the G. J. Eveson Coal and Coke Company, Limited, of Birmingham, whose death occurred last June, left estate of the gross value of £63,005. Among his bequests he left £1 for each employee in the Company for each year of service up to twenty years.

SOME CONSIDERATIONS AS TO CALORIFIC VALUE AND CALORIFIC STANDARDS.

By J. T. Dunn, D.Sc., F.I.C.

[A Paper read before the North of England Gas Managers' Association, Saturday, Oct. 2.]

When my old friend Mr. Waddom asked me to write a paper during his presidency on the question of statutory calorific standards for gas, I could do no other than consent, although I felt there was nothing new to be said on the matter. I can only hope that the reiteration in other words of what has already been said may not weary you, and that perhaps progress may be helped, not only by new contributions to the question, but by the increase of the volume of expressed opinion.

Gas undertakings, being monopolies, have always been subjected to statutory restriction and regulation; and because their product was used solely for producing light, the test imposed on them was one of illuminating power. For many years the No. 1 "Argand" burner was prescribed for the test; and 16-candle gas was the usual standard. But altered conditions of manufacture, the use of higher temperatures to produce higher yields of gas, the difficulty of obtaining high-grade coals, tended to lower the quality of the gas as an illuminant, and it was felt that the No. 1 burner dealt unfairly with these poorer gases. In burning gas in an argand burner, the luminosity depends on the ratio between gas and air; and if we shut off the air almost completely till the flame smokes, then gradually admit more, we shall see the luminosity increase up to a certain point, just after the flame has ceased to smoke, then gradually diminish, till, if we can introduce enough air, there will be hardly any light at all, and we shall approach the condition of things in a bunsen burner. The No. 1 argand, in which the gas was to be burnt at a fixed rate, and in which the air supply could not be regulated, burnt 16-candle gas to fair advantage, but carried too much air for a poorer gas, and hence unduly decreased its luminosity. This could be partly remedied by burning the gas at an increased rate (which does not correspondingly increase the air), and calculating to the standard rate the luminosity so obtained. But a better plan, and one of use over a wider range of quality, is to keep the gas-rate constant, and regulate the air to get the highest luminosity. This is the plan adopted in the No. 2 burner, which is now the recognized burner for official tests of luminosity.

The following figures are instructive, showing as they do the luminosity of four samples of gas, each tested by the No. 1 burner at 5 cubic feet per hour, also at such a rate as to fill the chimney with flame and thus get the best effect out of the burner, and by the No. 2 burner.

No. 1, 5 cubic feet . . .	13·1	13·4	13·1	12·8 candles.
No. 1, best effect . . .	14·9	15·05	15·4	15·6 ,,
No. 2, 5 cubic feet . . .	17·5	17·5	18·0	17·8 ,,

They illustrate very well the dependence of the result upon the conditions of the experiment, and even when the conditions are prescribed—as in the London Gas Referees' instructions—the result is dependent on the very closest adherence to those conditions, and may be affected by circumstances not prescribed—like the pressure, the humidity, or the composition of the atmosphere in which the test is carried out.

However unsatisfactory a luminosity test may be, as long as luminosity was the only valuable characteristic of gas, such a test, carried out with as high a degree of accuracy as practicable, was obviously a reasonable and even a necessary thing. But at the present time, when a very large proportion of the total make of gas is used for heating and for the development of power, and when even that employed for producing light is used mainly in incandescent burners, which do not depend on the inherent luminosity of the gas, but yield a luminosity far higher than that by burning the gas so that it yields no inherent luminosity at all, we may well ask, in the language of the mathematician, whether a luminosity test is necessary and sufficient. Is the value of gas for these purposes dependent on its illuminating power, or is there any relation between that value and that power?

Energy Derivable from Combustion.

The heat given out during the combustion of gas is a measure of the energy derivable from the combustion; it is a fixed and definite quantity for any given gas, and tells us exactly what the value of the gas is to us, whether we use it as heat, or whether we convert it into mechanical effect or other form of energy. But the proportion of the energy which affects the eye is very small, and bears no constant relation to the total. The light we see no more represents the total energy of a burning gas than the sound we hear represents the energy of a vibrating spring. The spring may vibrate very energetically, but so slowly or so rapidly that we hear no sound. And heat may be given out from a combustible in a form not perceptible by the eye at all. The illuminating power of a gas is certainly no direct measure of its heating or energy value. Is there, however, any proportionality between them? Much work has been done on this question; and as the illuminants in coal gas have usually a higher heating value than the non-illuminants, it seems at first that illuminating and heating values should go up and down together, and that the luminosity test might also serve as an index to, if not a direct measure of, the heating value. This position was taken up by Mr. Grafton at Glasgow last year; but his figures show that it is only true to a limited extent, with gases of the same origin and generally similar composition. A carburetted water gas of 18 candles had a calorific value of 489 B.Th.U., for example, while a coal gas of only 16·5 candles had a calorific power of 580 B.Th.U.

We may take it, then, that for the purposes of heating and production of power, as well as for lighting by incandescent mantles, we ought to have a knowledge of the absolute number of heat units derivable from a cubic foot of the gas we are using. This can be done in two ways. We may analyze the gas, and calculate the calorific value from this analysis and from the published calorific values of its constituents, which have been determined with very great care, or we may determine it experimentally, with one of the excellent instruments which have been devised for the purpose—such as the Junkers' or the Boys' calorimeter. There is no question the latter is the more rapid, the more convenient, and in ordinary daily work the more accurate. These are instruments in daily use; and careful experimental work with them (such as that of Mr. Coste* and Mr. Holgate†) has shown the magnitude of the errors involved through differences between the temperatures of the ingoing gas and air and the outcoming products of combustion, variations in the humidity of the atmosphere, in the temperature (and thus the density) of the collected water, and so forth. The outcome of all this is that with these instruments the calorific value of any gas can be determined with a very satisfactory degree of accuracy.

In speaking of the accuracy of measurement, one ought to draw attention, perhaps, to the conditions of measurement in distributing gas. A consumer in Alston or Consett, for example, where the barometer is, roughly speaking, an inch lower than it is in Newcastle, may be getting a gas giving exactly the same number of B.Th.U. per cubic foot at 60° Fahr. and 30 inches barometer, as the gas at Newcastle; but every thousand cubic feet he buys only contain about 29-30ths of the actual amount of gas which the Newcastle consumer gets for 1000 cubic feet. Again, if we assume that our gas is always saturated with water vapour, the consumer at any place on a hot summer day with the thermometer at 75° Fahr. is only getting about 92 per cent. of the gas he will get in winter—or shall we say spring—with the thermometer at 40° Fahr., for the same registration on his meter.

Gross and Net Calorific Values.

It would be superfluous to describe these calorimeters or their working; but I should like to refer to two points in this connection. The first is the difference between the "gross" and the "net" calorific value. As is well known, the gross or total heat value is the amount of heat given off by the combustion of the gas, starting with the gas and air at a given temperature—say 60° Fahr.—and ending with the products of combustion at or near the same temperature. This involves the condensation to water of the steam formed by the combustion of all the constituents of the gas which contain hydrogen, and the cooling of this water, with the other products of combustion, to the starting temperature; and it is, for the same gas, a perfectly definite figure. The net value is obtained by determining the amount of water formed during the combustion, and deducting from the gross value the amount of heat which this water evolved in condensing to water from steam measured at 212° Fahr., and in cooling from 212° to the initial temperature.

Now this is a perfectly arbitrary figure. It is often said that it is of use, because we do not, in the practical usage of gas (or of any other fuel), cool the products to atmospheric temperature. But neither do we let them go always at 212° Fahr., nor do we let the steam go at this temperature and treat the other products differently. The whole of the products escape at the same temperature, whatever that temperature may be. The net value does afford a means of comparing gases having similar gross values but differing in their hydrogen content; and the determination of the amount of water formed allows us to calculate, if we wish, the amount of this hydrogen. But it does not measure for us the amount of heat available under the actual conditions of ordinary combustion, to calculate which we must know these conditions and the composition of the gas, and thence calculate the amount of heat carried away in the products of combustion.

Take, for example, the following gas, averaged from four samples of coal gas quoted by Mr. Coste in his paper, and for which I have calculated the amount of air needed and the volume of the products of combustion of a cubic foot:—

	Cubic Feet.	Air Needed.	CO_2	Steam.	Nitrogen.
H_2 .	0·462	1·109	—	0·462	0·878
CH_4 .	0·332	3·187	0·332	0·664	2·523
C_3H_6 .	0·037	0·800	0·111	0·111	0·633
CO .	0·082	0·197	0·082	—	0·156
CO_2 .	0·020	—	0·020	—	—
O_2 .	0·005	—	—	—	—
N_2 .	0·061	—	—	—	0·061
	0·999	5·293	0·545	1·237	4·251
Less in gas. . . .		0·025			
		5·268			

* "Journal of the Society of Chemical Industry," Vol. XXVIII., p. 1231.
† "Journal of Gas Lighting," Vol. CIX., p. 355, and *post*.

The calorific value as determined was: Gross, 596 B.Th.U.; net, 533 B.Th.U.

Now suppose all the products are to escape at 212° Fahr., we must subtract from the gross value the amounts of heat needed to raise from (say) 60° to 212° Fahr. the gaseous nitrogen and carbon dioxide and the liquid water, and to vaporize this water at 212°. We shall find these amounts to be 11·61, 2·08, 9·1, and 58 B.Th.U. respectively. If we subtract the sum of the last two, 67·1 from 596, we get the calculated "net" value, 528·9—not very different from the determined 533. But for the actual heat available in the circumstances, we must subtract the total of the four, 80·8; leaving an "available" calorific value of 515·2. If the products are to escape at 302° instead of at 212° Fahr., we shall, further, have to deduct the heat needed to raise the nitrogen, carbon dioxide, and steam through 90°, which will come out at 10·7 B.Th.U.—leaving for available heat, 504·5.

And, if instead of supposing that only the air needed for combustion is present, we assume that half as much air again is there as excess air, which is a very reasonable assumption, we must further deduct the heat needed to raise this air to 212° or 302° Fahr., which is 7·2 and 11·5 B.Th.U. respectively—reducing our available calorific power to 509 when the products leave at 212°, and to 493·1 if they leave at 302°. Any one of these figures may be called a "net" value for a particular set of circumstances; but there can be for a given gas only one gross or total value.

The second point is a related one. If we are using our gas to boil water, for instance, the value of a given gas will be directly as its calorific power; and it will be indifferent to us whether we derive 600 B.Th.U. from one or from two cubic feet of gas, if the second gas is half the price of the first. But to heat an incandescent mantle, or for other work involving high temperatures, the flame temperature is important; for as we raise the temperature of the mantle we increase the luminosity in a still greater degree. Now flame temperature depends, not only on the amount of heat given by a cubic foot of the gas, but on the amount of material on which the heat has to spend itself—that is to say, on the amount of the products of combustion. We must regard not only the gas as generating a certain amount of heat, but the amount of oxygen which is necessary and which shares in the generation of heat, and, further, the quantity of nitrogen associated with the oxygen, and the amounts of carbon dioxide and water produced.

The following figures, relating to the combustion of a cubic foot of each of the ordinary constituents of coal gas, will show this:

—	Air Needed. Cubic Feet.	B.Th.U. (Products at 212°) per Cubic Foot of		Volume of Products.		
		Gas.	Mixture.	Steam.	CO_2.	Nitrogen.
H_2 . .	2·4	263	77·0	0·5	..	1·9
CH_4. .	9·6	875	82 4	2·0	1·0	7·6
C_2H_4 .	14·4	1433	93·0	2 0	2·0	11·4
C_6H_6 .	21·6	2102	93·0	3·0	3·0	17·1
C_6H_6 .	36·0	3448	93·5	3·0	6·0	28·5
CO . .	2·4	312	91·7	..	1·0	1·9

We see from this that while there are enormous differences in the calorific values of a cubic foot of the different gases, yet the differences in the calorific values of a cubic foot of the mixtures which are required for complete combustion—and which are really the things we have to compare—are very small. And if, from the capacities for heat of the various gaseous products and the available heat of a cubic foot of each mixture, we calculate the temperatures to which this heat could raise these products—which, from want of trustworthy experimental data, we can only do roughly—we shall find that these "maximum flame temperatures" so obtained do not differ very considerably, but that the gases of lowest calorific value (hydrogen and carbon monoxide) give the highest values, and hence may be regarded as preferable, from the point of view of incandescent lighting, to gases of higher calorific value. Not, of course, that they would be worth more per cubic foot, but that a given number of British thermal units conveyed by their means would have advantages over the same number of British thermal units conveyed by means of one of the other gases.

In view of all this, it appears that—not accurately, but approximately—the value of a cubic foot of gas is proportional to its calorific power, but that, within reasonable limits, if we can supply to a mantle per second a certain number of B.Th.U., it makes little difference whether these are furnished by a small volume of rich gas or a larger volume of poorer gas, since equal volumes of the mixture in either case, in contact with the mantle at a given moment, carry not very different quantities of heat. So far as there is a difference, it is in favour of gases containing considerable proportions of hydrogen or carbon monoxide.

If, then, the question is put whether gas undertakings, having to satisfy statutory requirements, should work to a standard heating value in their gas, the answer, in view of the importance of calorific power for the uses to which almost the whole make of gas is now put, must be "Yes." And if, further, it be asked whether the test for illuminating power should be retained, the answer depends on the extent of the usefulness of such a test. Mr. Thomas Hardie, in a paper read in 1909, stated that in 1906, 93 per cent of the penny-in-the-slot consumers in Newcastle used incandescent burners, and that in Edinburgh (then supplying a 20-candle gas) the percentage over the whole of the consumers was 65, and of the artisan consumers 91. We may safely assume that to-day the number of flat-flame burners will have been much further reduced; and it would probably be a difficult matter to discover anyone using an argand burner. In these circumstances, there is practically no service rendered by the test; and it becomes a requirement purely formal, and may hamper gas undertakings and prejudice consumers, by preventing the adoption of methods of manufacture that would mean economic advantage from the point of view of calorific value.

The Standard for Calorific Value.

As to what figure should be adopted for the standard of calorific value, I do not feel competent to speak. I will only point out that, as we have seen, there is no very striking advantage in having a gas of very high calorific value (unless, of course, its cost is at the same time going to be low); but for all the uses of gas there is a very great advantage in having the supply regular and constant. If, then, greater control is possible over the manufacture of gas of not very high heating value, and greater constancy of quality can be attained than with a richer gas, then with the poorer gas rests the greater economy provided cost per B.Th.U. be not in favour of the other. What quality of gas is most economically producible, it would be presumption on my part to say. But the experimental work of the German gas engineers has at any rate shown that as the temperature of distillation is raised, and the yield of gas increased, though the illuminating power and the B.Th.U. per cubic foot are decreased, yet a larger proportion of the total heating value of the coal is found in the total make of gas. But whatever the numerical value of the standard fixed, I think gross value should be specified, whether or not there be any restriction also on the net value; because, as we have seen, the gross value is a fixed and definite characteristic of the gas, while the net value is only one of many arbitrary values, each depending on the conditions of the combustion.

A Plea for the Metric System.

There is another measure which I think would be of even greater benefit to the gas industry, as well as to the rest of the nation, than the imposition of calorific standards or the removal of illuminating ones. That is, an Act abolishing all that monstrous "concatenation of absurdities" which, with unconscious irony, we call the British "system" of weights and measures—an Act to throw hundredweights and tons, and feet and inches, quarts and gallons, poles and perches, bushels and acres, drams, scruples, hogsheads, pecks, and all the rest of the crew, upon a common scrap heap, and burn or bury them, and to give us the metric system for our use. I fear we are not likely in the near future to see such an Act passed, though it would be one of the most useful steps possible in the direction of capturing German trade, of whichwe hear so much nowadays. But we can surely at least ask that the metric system shall be kept clear of our insular confusion; that calorific standards shall be expressed either in British or in metric units but not in both; and that such barbarisms as 125 calories per cubic foot shall not be permitted to occur in future.

DISCUSSION.

Mr. Charles Wood (Bradford) said their best thanks were due to Mr. Dunn for his paper. They were practically in agreement with what the author claimed as to the absurdity of expressing the heat value of gas in net units. Mr. Dunn's view was quite sound. He had never heard the matter put more clearly. It had always seemed to him absurd to talk about net calorific power. It all depended upon the purpose to which the gas was to be put, as to what they got out of it. He never used net figures; the gross figures certainly sounded better and looked better. Why should they tell people they were supplying 500 B.Th.U. gas, when they knew the aggregate was 530 or 540 gross. They never talked about net figures in his district. Of course, at the present time he did not think they were likely to be worried in any way with legislation defining it; and probably before they could get an Act of Parliament doing away with the illuminating power tests, many other circumstances might have occurred. He was quite sure the best gas to be supplied, as the author of the paper said, would be that which they could produce most economically whatever quality it was, whether it was 500, 400, or 300 B.Th.U., or perhaps even less. It was a subject about which they had not been thinking much recently. Many of them were having to supply, or were supplying, gas of lower calorific power than before the war. He had heard only that week, on the best authority, of a gas which was being supplied of which he did not know the calorific value; but in a flat-flame burner it gave absolutely no light at all. In case any of them thought it was his neighbour, he might tell them that it was a gas that was being supplied in Berlin. He did not think they would quite get down to that in this country. He had listened to the paper with great pleasure, and thought it was one which could be carefully studied afterwards.

The President said that after the remarks of Mr. Wood, there was not much left to be said on the subject. He was going to say it was a burning question to many of them, and would continue to be until some of the absurd restrictions were removed by Act of Parliament. There were a good many anomalies which could be easily removed. They were all agreed as to their lack of necessity; all they wanted was a push in order to fairly set them going.

WALES AND MONMOUTHSHIRE DISTRICT INSTITUTION OF GAS ENGINEERS AND MANAGERS.

Half-Yearly Meeting at Caerphilly.

IT may confidently be asserted that not one of the members of the Institution present at the meeting which was held at Caerphilly last Wednesday regretted, when the day was done, having undertaken the journey; for the programme drawn up, in its fulfilment, proved in a high degree interesting. The time set aside for the business meeting was, indeed, as the event showed, much too short for all that there was to be said on the different subjects introduced; but this was not in any way prejudicial to the after-proceedings. Luncheon, on the invitation of the Chairman and Directors of the Rhymney and Aber Valleys Gas and Water Company, was none the less enjoyable from the fact that the visitors had waited for it somewhat beyond the appointed hour; and the inspection of the new gas-works now in course of construction, and the stately Castle ruins, as well as the subsequent tea as the guests of the Company, were thoroughly enjoyed. The invitation to visit Caerphilly arose, of course, from the fact that the President of the Institution, Mr. A. W. Branson, though now occupying the position of Engineer and General Manager to the Hartlepool Gas and Water Company (in succession to the late Mr. Thomas Bower) was, at the time of his election to the chair, in May, 1914, Engineer to the Rhymney Company. He thus had the somewhat unique experience last Wednesday, as was remarked at the luncheon, of "being shown round the works that he had so largely designed and had had so big a hand in constructing," by Mr. J. P. Jones (the General Manager and Secretary) and Mr. B. Grainger (the new Engineer). As for the technical business, it will be seen that Mr. Branson's unavoidably postponed Presidential Address proved quite worth waiting for, and was well discussed, as was also a paper by Mr. F. C. O. Speyer on "Home Sales of Sulphate of Ammonia." With the weather kind, and such good "fare" provided, the meeting could hardly have been other than the success it was.

The Meeting was held in the Offices of the Gas and Water Company, St. Martin's Road, Caerphilly. Mr. A. W. BRANSON, of West Hartlepool (the President), occupied the chair; and there was a good—under the prevailing conditions, it may be said to have been a very good—attendance of members.

CONFIRMATION OF MINUTES.

The HON. SECRETARY (Mr. Octavius Thomas, of Pentre) read the minutes of the previous meeting; and they were confirmed.

NEW MEMBER.

On the proposition of Mr. THOMAS CANNING (Newport), seconded by Mr. J. H. CANNING (Newport), Mr. Ernest D. Wootten, the Manager of the Abertillery Gas-Works, was elected a member of the Institution.

PRESIDENTIAL ADDRESS.

The PRESIDENT then proceeded to deliver his Inaugural Address, which, owing to the circumstances then prevailing, had been postponed from the previous meeting. Certain portions of the address he regarded as particularly suitable for discussion; and he therefore invited expressions of opinions from members with regard to what he had to say.

The honour of holding the office of President of the Wales and Monmouthshire Institution is one I greatly appreciate, and is due, I feel, probably more to the goodwill of the members than any special fitness on my part. My removal to the North of England and the trying and tieing times have prevented me from fulfilling the duties as fully as I would have liked; and I am therefore indebted to the Secretary, Mr. Octavius Thomas, and the Council for their kind consideration.

THE GAS INDUSTRY IN WAR TIME.

We are again met under the circumstances of war; yet I think we may claim, without undue optimism, that the gas industry, in spite of a long list of difficulties, is so far standing the stress and strain very well, and is in addition, contributing in no mean way to the successful prosecution of the war. It has been usual on occasions like this to review, on more or less broad lines, the progress of the industry, and those methods by which it is thought further advances may best be secured. But I would more particularly allude to-day to the exceptional conditions arising out of this stupendous and awful war. At the outset, gas engineers and managers were greatly concerned as to what effect it would have on the welfare of their undertakings, and to what extent the industry generally would suffer from the dislocation and destruction which were likely to accompany the war. Now, after more than twelve months' experience, we know something of these effects, and can better judge what further may be expected, and how best to meet it.

It will be remembered that one of the first effects of the war was the sudden rise in the Bank-rate from 3 to 10 per cent. This was very disturbing at the time to those concerns working with a large overdraft. But, fortunately, it was only a very temporary condition; and the rate was quickly dropped back to 5 per cent. The moratorium, changes in currency, and the standard prices of food, steadied the public mind, and the country settled down, rather too easily perhaps, to war conditions, and talk of "business as usual" was indulged in.

The supply and delivery of necessary stores previously received from our enemies appeared at first likely to present serious difficulty; but this has been overcome almost entirely. It is to be hoped gas managers will for the future do all they possibly can to foster our independence of German and Austrian goods.

Also as affecting the gas industry, it is good to note the steps taken to make the British textile industries independent of imported dyes. I hope the same may be done in connection with the bases of drugs, so largely hitherto supplied from abroad.

Almost every article and raw material used in gas manufacture has increased materially in cost, but, with the exception of coal, not to such an extent as to cause surprise or particular criticism. It was even thought by some in the early stages of the war that the price of coal, owing to decreased consumption for ordinary manufacturing purposes, would rise very little; but in this they were sadly deceived.

COAL QUESTIONS.

Our thanks are due to those members of the industry who gave their time and influence towards obtaining the measure of relief afforded by the Coal Price Limitation Act—more particularly for the security it affords as to price for the remaining period of the war. There is still the fear as to short deliveries in the winter; and it would be a poor policy to attempt to reduce coal orders between now and the 1st of November, as some of the colliery people have suggested would be done by gas managers, in order to have a bigger balance to receive at the reduced figure.

The question of increased storage of coal has become more and more important of recent years; and every effort should be made to minimize as much as possible the disparity between winter and summer deliveries. Under statutory control as gas concerns are, in the matter of price of gas and dividend payable, it seems only right they should have some power to appeal against forced prices for coal which they cannot do without; and if this principle is established now, it may lead to some such control being later on instituted.

THE COKE MARKET.

The position of the coke market has greatly improved during the last six months; and the heavy stocks in hand which caused so much concern at the beginning of the year have disappeared. It is to be hoped this state of things will continue through the winter; for, with a shortage of labour, heavy stocks would be more than usually embarrassing. It has been suggested that Parliament having restricted the price of coal, a similar limitation should be applied to coke, and that gas undertakings are being favoured, and, as a result, are obtaining abnormally big prices for coke. The majority of gas undertakings, however, have not increased their prices for home consumption and to local consumers more than 3s. to 4s. per ton, or only about one-half the rate of increase they themselves have had to pay for coal. It is only the surplus quantities of exported coke for which anything like high prices have been charged.

GAS EMPLOYEES' RESPONSE TO THE CALL TO ARMS.

We are glad, and indeed very proud, that so many gas-works employees have responded to the call to arms—in some works as many as 30 per cent. having joined the Colours. All honour to them, and a safe return. As a result, casuals, elderly men, boys, and females have been drawn into employment. It is evident, in connection with the recent registration, that all remaining men of military age will be shortly approached and urged or compelled to enlist or go on munition work; and Government badges for strictly indispensable men have become an urgent necessity, if gas undertakings are to fulfil their statutory obligations.

When the best efforts have been made, it will mean in many places possessing the necessary plants the using of a large percentage of carburetted water gas in spite of the high prices for both oil and coke.

INCREASES AND DECREASES.

The effect of the war on the output of gas has been very marked and varied. In some cases record increases have been experienced

by reason of the extraordinary supplies to the military, hospitals, internment camps, armament works, &c.; while others, not so fortunately situated, owing to severe restrictions in public and private lighting and general economy practised by consumers, are suffering decreases amounting to as much as 15 to 20 per cent.

LIGHTING AGREEMENT.

The restricted public lighting has prevented the fulfilment in many towns of the conditions of lighting contracts, and led to differences in settling accounts with the local authorities. I think in such cases if gas undertakings make an allowance for the unconsumed gas short of the minimum stipulated in the agreement (such allowance to represent as nearly as possible the actual saving only effected by not having to manufacture the gas), they are doing all that should be expected, especially bearing in mind the increased costs since the war began, which could not be foreseen when the lighting agreements were entered into.

CONSUMERS' ECONOMY.

I believe we may anticipate much further economy in gas consumption by consumers. The licensed trade, for instance, are hard hit, and will certainly reduce their expenditure all they possibly can, to balance their diminished income. The best way undoubtedly to meet these temporary losses is by making special efforts to secure all possible orders for cookers, fires, and gas appliances. It would be difficult to find a better opportunity than the present, with coal high in price and every likelihood of shortage in the winter, and in addition many people, either from choice or necessity, will be without domestic servants. In the case of gas-fires, although it is difficult to get canvassers, an early start should be made, so as to ease the labour of fixing when short-handed, and also to avoid crowding the makers with orders, as they are busy on munition work in addition to their ordinary business.

BOMBARDMENT AND AIR-RAID DAMAGE.

Actual damage by the enemy to gas-works has so far been confined to the Hartlepool works, bombarded last December; but gas-mains in the street have been broken by bombs from Zeppelins. A gas manager on the east coast, who successfully dealt with a broken gas-main, advises that a stock of wetted clay be kept in readiness at the works for such emergencies. A good deal can be done to extinguish the flames by standing off and throwing the clay at the main where affected.

INSURANCE RATES.

The rates under the Government scheme of insurance against damage from air-craft and bombardment are a big reduction on those obtainable before from Lloyd's; but I am of opinion that it would have been fair and reasonable if all property had been subject to a small war risk tax to meet these risks. As it is, the rates are such that insurance will be largely confined to the east-coast towns and places not far inland, and will bear heavily on undertakings suffering already from increased working costs and reduced consumption.

THE OUTLOOK FOR GAS STOCKS.

Gas undertakings which have carried forward an undivided balance from year to year are now reaping the benefit of such a policy; and it is likely much more thought will be given in this direction in future. It has always been the steady dividend from gas investments which has attracted and given confidence to investors. Now this feature becomes more important still, by reason of the higher standard of values set up for capital, and a substantial sum in hand becomes a necessity, if emergencies are to be met without fluctuations in the rate of dividend.

We have seen how gas stocks have depreciated, both in the maximum-dividend and the sliding-scale companies, through the financial conditions arising out of the war; and as these conditions are likely to continue for a long time to come, it has been suggested that Parliament should be approached and applications made for powers to raise the standard price and the dividend payable in the case of sliding-scale companies, and that greater freedom should be given in the raising of loan capital and the issue of redeemable stock.

Such applications would entail parliamentary expenses on many concerns at a time they can ill-afford it, and bring about disturbing local opposition. If it is practicable, it would be better for representations by the gas industry as a whole to be made to the Government to secure the introduction of a General Act giving the relief required, or, failing a General Act, if gas undertakings under like conditions would combine for the promotion of joint Bills.

It is realized generally that it will be impossible for some years after the war is over to raise gas capital on the old pre-war terms. But capital will have to be found to provide modernizing and extensions of plant required, and for gas appliances; and probably where the need is very pressing, powers will be sought to attach a temporary preference to new ordinary stock issued, and to allow same to be offered to existing shareholders and consumers at a discount. Such a course is much to be preferred to starving a concern for capital and placing the whole burden of increased costs on the consumer.

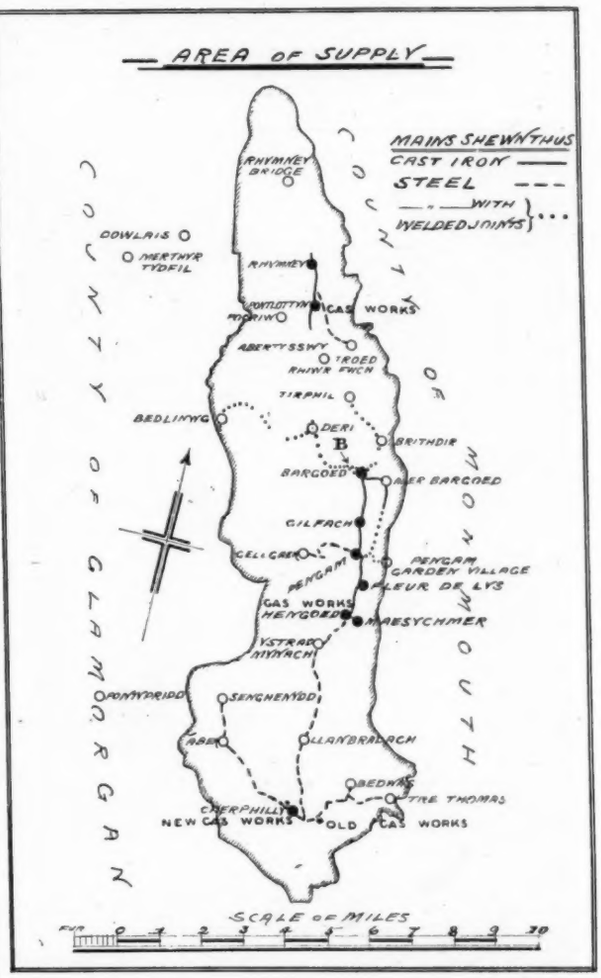
VALUE OF THE SPECIAL PURPOSES SECTION.

It is very much in the interest of a gas undertaking, in these days particularly, that the manager should be a member and attend the meetings of the Special Purposes Section in his district. Many unusual difficulties and matters of urgency in the management of gas undertakings have arisen during the war; and the meetings—affording, as they do, regular interchange of views and experience—are very valuable help indeed.

GAS SUPPLY IN THE RHYMNEY AND ABER VALLEYS.

In meeting at Caerphilly to-day, as the guests of the Rhymney and Aber Company, I am permitted to give some particulars of the system of distribution adopted for the supply of the twenty colliery places now supplied by the Company with gas, and trust they will prove topics for useful discussion by the members.

The area of supply amounts to some 60 square miles, and, as will be seen from the map, includes the Rhymney Valley from Rhymney Bridge to Trethomas, a distance of over 17 miles; the Aber Valley, 4 miles in length, branching off at Caerphilly; the Deri Valley, 5 miles long, branching off at Bargoed; and it also includes the eastern side of the Taff Valley from Bedlinog down to Treharris.



Some eight years ago the places supplied were those shown by a solid black circle on the map; and the object has been to link-up these places with others not then supplied, and centralize the manufacture at one new works at Caerphilly, stopping-down the old works at Caerphilly, Hengoed, and Pontlottyn. A serious objection to such a proposal of linking-up was the very heavy capital outlay for mains, and the increased likelihood of leakage by reason of the greatly increased mileage of mains. The first objection was largely met by the installation of compressors at Caerphilly, Hengoed, and Bargoed, to deliver gas under pressure and enable connecting mains of small diameter to be used.

COMPRESSORS.

The compressor at the Caerphilly new works is of the Bryan Donkin Company's rotary type, water-cooled, to pass 35,000 cubic feet per hour at 115 revolutions per minute against 10 lbs. pressure. It is fitted with a set of forced lubrication arrangement, including three ram pumps, and driven by a horizontal steam-engine with steam at 100 lbs. per square inch. The engine has two fly-wheels, the boss of one of which is formed as a half-coupling, so that a duplicate compressor may be added when desired.

The Hengoed compressors consist of two single-stage rotary compressors, each capable of passing 10,000 cubic feet of gas per hour at 200 revolutions per minute against 3 lbs. per square inch at the outlet, and driven by a horizontal 10 B.H.P. gas-engine fixed between the compressors. The flanged couplings are each provided with loose plates, so that either compressor may be discon-

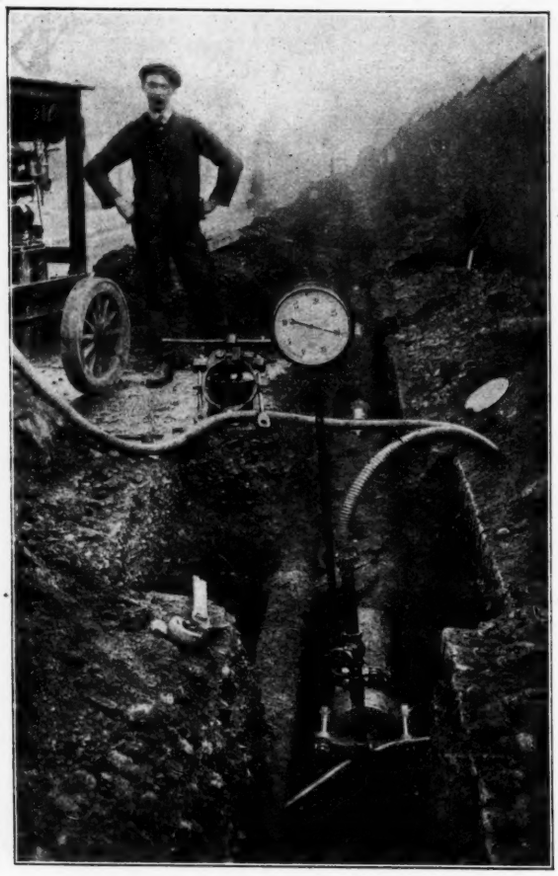
nected at any time. This set has now been in daily use for close on five years, and found to be very reliable and to stand the wear and tear excellently.

The Bargoed set is of the same rotary type, each to pass 20,000 cubic feet per hour at 260 revolutions per minute against 3½ lbs. pressure, but driven by separate gas-engines.

STEEL V. CAST-IRON MAINS.

The second objection referred to—that is, the increased likelihood of leakage, owing to the greatly increased mileage of mains—was met by adopting steel mains instead of cast iron, which reduced the number of joints to a minimum. Whatever may be said as to the longer life of cast-iron pipes, the difference in this respect is not to my mind sufficient to counterbalance the advantages of the steel main (coated, wrapped, and recoated), with the rigid or long sleeve joint, for a scattered mining area like the Rhymney and Aber Valleys, either for the distribution of high or low pressure gas. In all cases, the joint was made with lead wool or welded.

In addition to subsidence, there is so much heavy traffic—very often upon roads or lanes with but little foundation—that cast-iron mains with joints every three or four yards, and depending entirely for flexibility on these joints, leak everlastingly, and are frequently fractured. The turned-and-bored joint for cast-iron



Testing a Steel Gas-Main with Welded Joints.

pipes is, we know, an excellent one under certain conditions; but it is too rigid where there is subsidence or heavy traffic. As an instance of this, a length of about a mile had to be discarded in one part of the valley, owing to repeated fracture.

The steel main with rigid or long sleeve joints retains the advantages of the turned-and-bored joint, and the pipes do not fracture. In the last six years, over forty miles of coated, wrapped, and recoated steel tubes have been laid with lead wool joints. You will be familiar with the arguments in favour of lead wool; but an experience with a length of cast-iron main with hot lead joints influenced me considerably in its favour.

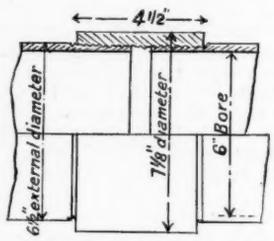
The main in question was a cast-iron one, about four miles in length, with cast-lead joints. Owing to continual leakage, the ground was opened-out in a number of places and the joints recaulked. Ultimately, about three years after the main was laid, it was tested and found to be still losing 346 feet per hour on the whole length. The ground was then opened practically the entire length of the main; and four joints out of every six were found to be leaking. The joints were well filled and neatly caulked on the face—probably before the lead had sufficient time to cool properly; so that some of the shrinkage took place after caulking, and leakage resulted. Most of the joints were leaking near the top. With lead wool, there would have been none of this shrinkage, and the joints would have been knocked-up solid, strand over strand, from the back to the front of the socket in order to put in the specified quantity of lead.

Some long lengths of steel main have now been in use in the district for the last six years, and the ground opened from time to time in very many places. So far, however, I have not seen or heard of any corrosion of the tubes beneath the canvas coating. The time is short; but experience is accumulating which will, I believe, remove the fear in the minds of many as to the life of steel tubes when properly coated and wrapped.

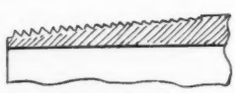
A WEAKNESS IN CURVES.

Although steel tubes and lead wool joints will undoubtedly stand vibration and subsidence better than cast-iron ones, and there is the advantage of having only about one-third the number of joints at which leakage can possibly occur, yet they cannot be absolutely relied on to remain sound. It was found that one cause was the over-curving of the pipes in going round bends in the road. It is certainly very convenient to pull a steel tube round a curve and dispense with special sweeps; but it is liable to be overdone. The tubes, when pulled to the desired sweep, are wedged in position in the trench, and after the ground is filled in, the spring in the tubes tends to press the packing into the sides of the trench and cause the joints on the curve to draw. Then, also, the vibration of heavy traffic still causes joints to leak.

To get over this difficulty when it was proposed to take gas to Bedwas, we considered a proposal by Messrs. Stewarts and Lloyds to lay pipes with a tapered screwed joint, the ferrules having a right and left hand thread as per sketch. This appeared to be an improvement on lead joints, but had to my mind several serious objections—the danger of the threads being damaged when handling the pipes, and the difficulty of entering the pipes into the ferrules and avoiding the crossing of the thread. Then,



Standard 6-Inch Socket Joint.



Taper Thread.

if a branch connection was required, it would mean cutting and threading the pipe ends in the trench, or else (more probably) using connections with lead joints. These objections seemed so serious that we gave up the idea; but I understand that since then they have been used successfully for high-pressure gas in the Birmingham and Staffordshire district, as also at Tamworth and Preston.

Later we had offered the steel tube with a rigid or long sleeve welded joint; and after seeing a number of sample joints welded and tested for soundness, both before and after squeezing in a hydraulic press, we decided in favour of their adoption. At first I thought of providing long sleeve lead wool joints with Kimberley collars at intervals, to allow for the expansion and contraction of the main, but came to the conclusion that the variations of temperature to which the main would be subjected, and which is estimated as not exceeding 20° Fahr., would be readily met by the flexibility of the main, and that the joints themselves would have an ample margin of strength to stand the stress.

The first length of steel main with welded rigid joints to be laid in this district was from Bargoed to Deri, some two years ago, and consisted of 1040 yards of 6-inch and 2113 yards of 5-inch. This main has since then been extended over the mountain to Bedlinog, in 4-inch, with welded joints—an added distance of over three miles.

The tubes were welded together outside the trench, in lengths of about 100 yards—being rolled over on supporting trestles to enable the welder to work on the top of the joint all the time. The joints in this way were made more expeditiously and with more certainty of making a good job. Before lifting these long lengths into the trench, they were capped-off at each end and tested to a minimum pressure of 20 lbs. per square inch by means of a hand-wheel pump such as is used in diving operations. Then, after being placed in the trench and welded-up to the length previously laid, the main was tested again, and the position of the joints made in the trench marked, so that they could be readily located if any leakage should occur later.

It was thought that if there was any failure in the jointing these particular joints would be the most likely ones, as welding on the underside of a pipe requires a good deal more skill than when working on top. The cost of the welding on the Bargoed to Deri section (length 3160 yards), inclusive of labour, carbide, oxygen, and use of generator, amounted to £37 8s. 4d., or very little more than for lead wool jointing. The main was laid bottle-tight; and its chances of remaining so appear to me much more certain than in the case of steel tubes with lead wool joints, and infinitely more than in the case of cast-iron mains with cast lead joints.

The gas is supplied from the Bargoed compressors through this main to Deri and Bedlinog at an initial pressure of 3½ lbs. per

square inch; and the two villages are fed through Reynolds district governors into low-pressure systems of steel mains with lead wool joints. The lower part of Bedlinog is 400 feet below the top street, and the governors have to be set accordingly; but charts taken at Bedlinog show that the pressure to the consumer is very steady and regular.

From the same compressors at Bargoed a supply in bulk is given, through about 6000 yards of 6-inch steel tubes with welded joints, to Tirphil and Brithdir. The gas at Tirphil is measured through an ordinary station meter and delivered into a holder; but the supply at Brithdir is taken off the 6-inch high-pressure main *en route*, through a Parkinson high-pressure meter and a set of Reynolds' governors.

In deciding on the capacity of the compressors at Bargoed, the requirements were estimated as follows:—

Pontlottyn	4,000	cubic feet per hour.
Tirphil and Brithdir . . .	10,000	,, ,,
Deri	2,000	,, ,,
Bedlinog	4,000	,, ,,
	20,000	cubic feet per hour.

The pressure loss with these deliveries was calculated as under; and it will be seen that an initial pressure of 3½ lbs. per square inch leaves a fair margin.

		Cubic Feet per Hour.	Length.	Main.	Pressure Loss.
			Yards.	Inches.	Lbs.
No. 1 Length	Bargoed to point B on map .	20,000	1040	6	0·42
	B to Tirphil	14,000	4474	6	0·85
	Tirphil to Pontlottyn . . .	4,000	4520	6	0·07
					1·34
No. 2 Length	B to Deri	6,000	2113	5	0·17
	Deri to Bedlinog	4,000	5300	3	2·50
					2·67

These deliveries at ordinary low pressures would have required at least a 14-inch main on the No. 1 length and a 10-inch main on the No. 2. The pressure at the point B is 3·08 lbs., and sufficient to deliver gas through both lengths of main from B to Pontlottyn and from B to Bedlinog. The length from Deri to Bedlinog was finally laid in 4-inch instead of 3-inch, with a view to possible developments at Bedlinog.

It will be noticed on the upper part of the map that the length of main from Tirphil to Pontlottyn is not linked-up yet. Between these two places there is a portion of the road, about ¼ mile in length, which is slipping and settling towards the river, and has for some years been an endless source of trouble and expense in connection with the trunk water-main which passes along it. This main—part 14-inch, part 12-inch—has been broken or the joints drawn right out, time after time, owing to the movement of the ground. I have a vivid recollection of one February when a length of 50 to 60 feet broke away six times in three weeks, and we were engaged night and day on its repair practically the whole of this time.

About three years ago, this main was relaid in the worst place with 12-inch steel tubes with long sleeve lead wool joints—the pipes telescoping 14 inches. Since then there has been no further fracture of the main; and although the joints still draw, the process is more gradual, and the need for opening-out much less frequent. The Company have not decided so far to lay a gas-main along this piece of road; but if one is to be laid, it would almost seem that the only reliable way would be to lay a steel main with welded joints on the surface at the side of the road, and level it from time to time.

I will not take up your time further with details as to the arrangements for supply throughout the whole district. In each case, the compressors deliver either into a gasholder or through a governor into a low-pressure system of mains. The point is, however, that only by high-pressure distribution and the use of steel mains is it practicable to supply so many comparatively small outlying places. To use low pressure, the capital outlay in mains would be prohibitive, and to use cast-iron mains with lead joints would undoubtedly result, with such a long mileage of mains, in very excessive leakage. By the methods adopted, the output has been rapidly increased in the last eight years from 34 millions to 154 millions, accompanied by reductions in price, capital per million, and increases in dividends.

The problem of distribution in a district like this is not by any means an easy one, either in the case of gas or water; and as the members are engaged for the most part in similar areas, or probably worse as regards subsidence, I thought the subject would be of interest and draw useful discussion.

DISCUSSION.

Mr. Thomas Canning (Newport) said that he was perfectly sure there were a great many present who appreciated the address quite as much as he himself did, and who, at the same time, were certainly more capable of discussing it. A lead was, however, required from somebody; and it was this alone that prompted him to stand up the first in order to make a few observations. Before proceeding further, he wished to congratulate the President most sincerely upon having undoubtedly produced an address which for value and perfect clearness of expression he had seldom seen equalled in any of the addresses delivered, not only before their Institution, but before others. He was pleased to hear the reference to the Coal Prices (Limitation) Act, but could have wished very much that the President had given them the benefit of his advice to a greater extent upon this point. Perhaps, however, it was, on the whole, as well that this should not be done, and that they should not say too much about this matter at the present moment. It was going to become a very important question, and probably would lead to some considerable difference of opinion between the owners of gas undertakings and the owners of collieries. This being the case, it might be best for them, for the time being, to withhold any discussion upon the point. One thing seemed to him to be quite certain—and he believed the majority would be with him in this—that the maximum limit which had been fixed by Parliament in the Act was unquestionably most generous towards the coalowners. ["Hear, hear."] They had no right whatever to be standing against it; and he was perfectly sure that, if the owners of gas undertakings would buckle-up to the matter, and stand with a firm front, they would be able to prevent, to a considerable extent at least, any price being imposed upon them beyond that which, as he had said, had been so generously given by Parliament. There was nothing more important or more instructive in the whole of the address than the very lucid description which had been given of the system employed for the distribution of gas in this great district—for it was a very large district indeed to deal with. One point he agreed most strongly with was that it would be an economical impossibility to supply gas over this area without the adoption of high pressure; and with high pressure they could only have introduced steel mains. The life of these mains he knew was a much disputed matter. Experience had, of course, not yet been very extended on the point of durability; but he happened to have had one of these mains laid for the last fourteen years or so. At the end of about twelve years, he examined the main, to see the condition it was in. It was covered, coated, and re-coated, exactly as had been described in the address. It was also in a damp position—in fact, though not exactly flooded, the ground was from time to time thoroughly saturated with water. What he found was that the main was in quite as good a condition as when laid. The only change observable in it was that the coating, covering, and all the rest, had now become so much part and parcel of the main that it was very difficult to tell that it had ever been coated at all. They had completely amalgamated. He then thought it was advisable to see what was the condition of the steel beneath the coating; and on opening it at a particular point, he found it was in a state of perfect preservation. Therefore he had no fear whatever about the durability of these pipes. When laying them, they took very good care to provide themselves with a supply of coating, so that they could repair any abrasions, if these should happen to be caused in the transit of the pipes from the foundry to the works. It was absolutely necessary that these abrasions should be carefully noted, and when found they must be coated and re-coated. And the same with regard to joints. Those made with lead wool were certainly excellent. Presently he might say a word with reference to a better system, but lead wool joints were superior, in his opinion, to those made with hot lead, provided always—and it was a big proviso—the jointing was done properly. As the result of great experience with this system of jointing, he could state that it required something like three times the amount of labour in the caulking that the hot lead joint needed. There was no doubt whatever about this; and unless the labour was expended on them, the lead wool joints would not be as good as the others. Therefore they must take care that the joints were well and substantially made. Welding was undoubtedly the coming system; and he had already resolved that the next long length of main that it might become necessary for his Company to lay in steel, should have welded joints. He thought in the long run it would be found that they would cause great lessening of the risk of gas leakage. He was very pleased to see from the address that the Rhymney Company had succeeded in supplying the district of Bedlinog with gas. Anybody who visited that place, would see how difficult it was to furnish it with gas. He happened to be aware of this, because the District Council in whose area Bedlinog was situated asked for his views on the question of whether they should purchase gas or make it independently themselves. He thought he had given them the best advice—more especially when he understood that gas was already being satisfactorily supplied.

Mr. H. D. Madden (Cardiff) said he would like to associate himself with the congratulations of Mr. Canning to the President on his very clear address. The points dealt with would be very useful for reference, not only to members of the Institution, but also to others. The experience of steel mains in the area of supply shown on the chart, as stated by Mr. Branson, would be of great value to them. When the President first came to Caerphilly, he had a difficult task to perform, as he indicated very lightly in his address. It appeared that the only solution of the question of supplying the valleys was the employment of steel mains, and the scheme of distribution which had been outlined for linking-up the different points. Caerphilly and the surrounding district were to be congratulated on having had Mr. Branson for Engineer at that time, when so much reconstruction work was necessary, and also when extensions were taking place very rapidly. In regard to steel mains, he would like to add a word

to what Mr. Canning had just said. If lead wool was used, it was the care taken in hitting-up the joints that made a tight joint. He had not himself had experience of welded joints, and he would like to ask what was the effect of temperature in the mains underground. He did not mean with gas at ordinary pressure, but when coming from the compressors at a pressure of from 3 to 10 lbs. per square inch. When there was a fluctuating consumption, the temperatures varied considerably, unless some means were taken whereby the gas could be bye-passed. What he meant was that working under compression would raise the temperature inversely as the flow of gas came from the compressors. At night time, there was a constant cool stream of gas passing through the mains; but as the lights were shut off, and the consumption went down to (say) one-twentieth of the maximum, the compressors would be churning. Without some bye-pass arrangements, therefore, most people had found that the temperature was unduly raised, and expansion took place in the steel mains in the vicinity of the compressing station.

The PRESIDENT: There are automatic bye-passes to each set of compressors, so that when the pressure rises to a certain point the bye-pass comes into action, and the speed of the engines is at the same time reduced. This does away with the temperature trouble.

Mr. MADDEN said he had mentioned this point because he thought temperature did play a very important part in the expansion and contraction of steel mains, unless properly provided for. Experience had not been long enough for them to know what the life of these mains was; but in cases where they had been down only a few years, and had been opened up, he had examined them and found the laps in quite good condition. With a new holder now being erected, they had steel inlets and outlets put in. Of course, steel had the same advantages there as on the district. With cast iron, there was liability to fracture, which was entirely done away with by using steel; but the same precautions against corrosion had to be taken in that case.

Mr. R. A. BROWNING (Neath) remarked that there was just one thing arising out of the address which had struck him. In the case of gas undertakings experiencing difficulty from small mains and consequent insufficient supply, for the manager to go and tear up his streets or roads for the purpose of laying larger mains meant great trouble, and one that should be avoided as far as possible. Therefore, he thought that the references to pressure-raisers came in very opportunely. Instead of replacing their mains—especially at this time, with everything so dear—when they found there was a difficulty in getting adequate pressure at the extreme ends of their district, they should have some simple form of pressure-raiser that would overcome the trouble, and would probably only be required during certain hours.

Mr. G. R. G. CLARRY (Swansea) said that the remarks in the address on the subject of mains were of particular interest to him. He had not had very much experience with steel mains; but he had always thought one of the principal difficulties in deciding as to steel was the question of tapping the main. The President did not make any mention of this; and he would like to know whether there really was any difficulty arising in connection with it. Owing to the not very thick pipes, the threads might soon pull out; and he understood the plan of fitting a back-nut was not entirely successful.

Mr. J. E. KENSHOLE (Merthyr) said he had in mind the marked effect on the output of gas that had resulted from the restriction of public lighting. They knew that notices had been sent out to the local authorities asking them to reduce expenditure as much as possible; but he did not think it was quite the thing to do it at the expense of the public lighting—especially when the High Explosives Committee were calling for all the toluol they could get. If they were going to restrict the output of gas, the output of high explosives must be restricted also; and he thought this was rather the wrong way of going to work. He quite agreed that it might be necessary to do it on the East Coast, and in places where they could be bombarded or which Zeppelins could visit; but in the Midlands and on the West Coast, it did not seem to be called for. With regard to the financial questions that were likely to arise, it was certainly hard that gas undertakings should have to suffer—more particularly those working under the sliding-scale. A maximum dividend company was not affected to the same extent. There were some companies to his own knowledge who had got a low standard price, which in normal times was only just sufficient to enable them to earn and pay their standard dividend of 5 per cent.; and he did not think anyone would say that 5 per cent. was an exorbitant dividend in these days. But in consequence of the large increases in the price of coal (which they were quite unable to control), there were a number who had had to raise the price of gas; and as a result their dividends had been reduced. Something should be done for these companies; and he believed if proper representations were made to Parliament the probability was that they would be allowed either to increase their standard price temporarily or to increase the price of gas without reducing their dividend below 5 per cent. They were all aware that there were a large number of people dependent to a great extent on their investments in gas companies, which had always borne a high character as steady dividend-payers. As he had said, 5 per cent. was not excessive; but when this was reduced to 4 per cent., and in some instances even lower, and the tax deducted, in the case of those liable to income-tax, it was a very serious loss to investors. Therefore, something should certainly be done to bring the position of these companies before Parliament, with a view to the provision of a remedy. The question of raising capital in the future was no doubt going to be a very difficult one; and those companies who might have to resort to this step in the next few years, would, he was afraid, have to raise it at a discount. He did not see any possibility of them being able to place 5 per cent. investments at par, or anything near it.

Mr. W. C. JACKSON (Neath) expressed the opinion that the question of steel mains was one which certainly all the younger engineers were bound to go very deeply into in their time. It was gratifying to them to have heard the remarks of Mr. Canning, particularly regarding experience with steel mains in his district. He took it that in all cases it was essential that the mains should be coated, covered, and re-coated. It would not be sufficient to put steel mains in with simply a tar or bitumen coating without the wrapping. Mr. Clarry had also raised a question about the services, which was a matter that some of them would be glad to have advice upon. There were a number of service plants on the market; and they heard so much of the merits or demerits of this, that, or the other, that they would be glad to have some clear indication as to what was really considered to be the best method available. With reference to the nature of the soil and its influence, probably in the work of excavating over this large district the President had come across very varying soils; and, if so, it would be interesting to know whether he had noticed any difference in the effect of soils on the piping. Then, as to the depth at which the mains had been laid throughout the district. Were they tied to any particular depth, or by the use of steel mains had they been able to have less covering than had been the case with cast-iron ones?

Mr. A. J. WARD (Cardiff) remarked that, in view of the fact that they had laid steel mains at the Queen Alexandra Dock seven years ago, it might be interesting to hear what his experience had been. At that time, they put down about 3000 yards of 6-inch and 4-inch mains around the docks, in ground of varying character—some sandy soil, some clay, and some ashes with a good deal of alkali matter in it. On several occasions they had had to open the ground for the purpose of inserting new services, and so on; and the condition of the main had come under his own personal notice. What he had found was that the mains were in perfect condition—as good as, and perhaps better than, they were the day they were laid. There seemed to be a difference in the composition of the covering material after being exposed to the action of the earth in which the pipes were laid. The covering when laid in the first place was comparatively soft; but he found it was now exceedingly hard. It seemed as though a certain amount of silicate from the sand had become incorporated in the pitchy surface of the coating; and it was very nearly as hard as a stone. In fact, as Mr. Canning had mentioned, there appeared to have been a sort of chemical affinity taking place between the coating of the pipe and the steel. The only danger one had to guard against was the possibility of other men opening-up the ground and breaking into the coating with picks. It had to be seen to that places where abrasions occurred were quickly covered. With regard to connections, those he had used were of his own design. They were cast-iron double clips turned to the true surface of the main, and drilled and tapped to suit different sizes of service-pipes. He allowed the bend or the service-pipe to always go through the clip, so as to form a spigot which entered the hole in the main, and prevented any alteration of the position of the clip to bring it athwart the hole. He then put in lead washers and screwed down with two $\frac{5}{8}$-inch bolts. This he found made a remarkably good job. Several of the connections had been opened up, and they were perfectly tight. The soft lead washer round the spigot was squeezed right down on the main. An important point was that the bend should be allowed to go through the clip and into the main. He quite agreed that a lead wool or a welded joint would be superior to run lead joints for mains; and in the event of his laying any further mains of this description, he would certainly go for the welded joint.

The PRESIDENT remarked that, as the time was getting on, he thought they must close the present discussion. He was obliged to the various speakers for the generous terms in which they had referred to his address. Any commendation coming from Mr. Canning, for example, with his long experience, was exceedingly gratifying. In his opening remarks, Mr. Canning—whose views on gas matters they always appreciated—agreed that it might be wise not to say too much about the Coal Prices (Limitation) Act. In the North of England, they were still a little vague about the working of the Act; and it was a question that would be better dealt with by the Special Purposes Section than in general meeting. At any rate, whatever was done should be done unitedly, because the opposite camp were strongly united. With reference to Mr. Canning's emphasis upon the need for care in laying steel mains with lead wool, this was a very important matter indeed. There were a considerable number of points about laying steel mains which should be carefully kept in mind—points that could only be learnt by experience. Anyone attempting to lay steel mains must use every possible care. They should never be laid without being coated, wrapped, and re-coated; and any damaged spots, such as had been referred to in the discussion, should be properly attended to. In this district they had always used the Woodall and Parkinson expanding nipple and saddle, and had found it an excellent arrangement. The nipples, however, needed careful examining and gauging, so as to make sure they would expand when fitted in the main. When the saddle was fixed, the

whole thing was as firm as a rock. One simply could not knock it out of the main, if properly fixed. They had used some thousands of these; and, as he had said, they found them very satisfactory. With regard to the coal question, he did not know what the experience of the members might be as to coke licences; but in his part they had had a pretty broad intimation that the Coal Exports Committee intended to refuse licences for coke to a very considerable extent, and so ensure a large quantity of coke being kept in stock, in order to make up for any shortage of coal that might come about. This was rather hampering them; and he expected in that part of the world they were having the same difficulty. Indirect hints were being given, also, that if the price of coke locally was raised, such places were likely to be black-listed, so far as licences were concerned. Mr. Kenshole had referred to lighting agreements. What he (the President) had in mind was the restriction of lighting as the result of military orders, which corporations and councils had no choice but to carry out. But, even then, he thought they were not entitled to any further allowance than the amount that was saved by the gas company not having to manufacture the gas. The same thing applied to local authorities' lighting contracts. Any allowance made should only be the actual saving to the gas company by not supplying; and the profit that was estimated for in these agreements should still be received by the company. Interest on capital had to be met; and the plant was there, and had to be fully maintained, whether or not the agreements were carried out. With reference to the soil in which the steel mains had been laid, it had not, so far as he could remember, varied very greatly in that district, except, perhaps, when going over mountains. In one place, portions of ground were met with which were very peaty. He did not himself fear that the mains would corrode with the coating on them. This was the only part of the district, however, where there might be risk from the nature of the soil. The depth at which the mains were laid had always been with a minimum of 2 feet of cover. Some time ago, steel-tube advocates talked a good deal about 18 inches of cover; but he thought this was light for districts like Wales, where the roads in many cases were not strong, and there was much heavy motor traffic. Steel mains might bear the weight better than cast iron; but there was no need to put them near the surface for this reason. Any possible economy in such a direction was hardly worth taking advantage of. He had mentioned the question of men's badges. They had started to give badges at the works in Hartlepool. Private badges previously issued had been called in; and the new ones were being handed out in a very strict fashion. They were given to those engaged practically in carbonizing and on the carburetted water-gas plant; and they had refused them to the gas-fitting and inspecting departments. He was still trying to obtain badges for a certain number of these latter men; but so far without success.

On the proposition of Mr. Octavius Thomas, seconded by Mr. Kenshole, a hearty vote of thanks was passed to the President for his address.

Report of the Special Purposes Section.

Mr. T. H. Hazell (Newport), in moving the adoption of the report and statement of accounts of the Special Purposes Section for the past year, said the report showed the advantage of possessing such a section. Some of them much appreciated the information that had been received and passed from one member to another—in connection with the disposal of coke, for instance. There was a time within recent months when coke was a drug on the market; but, thanks to the information that had passed from mouth to mouth, some of them were able to find markets, and consequently to get better prices for their coke, owing to the existence of the Special Purposes Section. He, for one, was much disappointed with the result of the discussion that took place in connection with the Workmen's Compensation insurance. It was hoped that, by combining these risks in one company or one agency, it would have been possible to get to bed-rock rates for premiums. But, unfortunately, it seemed that everybody was on the make for himself. He was very glad reference had been made to the Coal Prices (Limitation) Act, though he agreed that it was as well not to say too much about it at the present moment. Those, however, who were particularly interested in the Act might be warned that gas undertakings did not read it in the same light as the colliery people did. The gas people looked upon it as a Limitation of Price Act; whereas, so far as he could find out, the collieries were disposed to regard it as a Coal Price Minimum Act. That was to say, they were inclined to base their negotiations upon 4s. as the minimum advance which they felt prepared to make in the price of coal under contracts that were affected by the Act. Those who were concerned with this business would have to look very carefully into matters. The balance-sheet of the section showed up satisfactorily; there being an increase in the amount in hand. He trusted attention would be given to the last paragraph of the report—"The Committee consider the work done by the section during the year has fully justified its existence; and it is hoped that during the coming year more members will join, so as to strengthen the section." He would like to say how pleased they all were to see the President among them once again that day, even though it was only for a short time. No doubt Mr. Branson was as glad to come to Caerphilly as they were to see him there.

Mr. Browning seconded the motion; and it was agreed to.

Representative on the Institution Council.

The President said it was unanimously recommended by the Council that Mr. H. D. Madden, the ex-President, as was the usual custom with them, should be appointed as their representative on the Council of the Institution of Gas Engineers for the year commencing in June, 1916. He begged to propose this.

Mr. R. G. Clarry seconded the resolution, which was carried.

The "C" Process.

The President remarked that they had been expecting to have Mr. John Bond, of Southport, with them, to speak on the "C" process; but unfortunately he was unable to come, owing to his being obliged to attend a Council meeting in London. The short time, however, that remained to them would be well filled by Mr. Speyer's paper on home sales of sulphate; and he would now call upon that gentleman.

HOME SALES OF SULPHATE OF AMMONIA.

Mr. F. C. O. Speyer (London) then read his paper on this subject, which was on the lines of that which he read before the North British Association at their Edinburgh meeting a few weeks ago, and which was reproduced in the "Journal" for Sept. 3, p. 512. At its conclusion,

The President said it seemed to be the wish of the Association to get gas-works to fix prices, and to encourage merchants to stock sulphate. Whether, however, the 10s. per ton proposed would be sufficient to induce corn and manure merchants to put themselves about, was a matter of doubt to him. In his own case, they supplied a number of local farmers, within a radius of (say) 8 miles of the town; and they had taken the same amount for many years now. The consumption did not seem to grow; and he doubted whether 10s. a ton was going to induce merchants to bring them more customers. Mr. Speyer said they carried out this system in Scotland; but he did not tell them with what success. That was to say, what percentage of the make in Scotland they sold at home. This would be a useful guide. They were all, he thought, convinced that the time had come when they should combine for the sale of sulphate of ammonia. Improved methods on the Continent, and the fact of this country having been supplanted as the leading maker, might be expected to have their effect on prices.

Mr. Thomas Canning (Newport) said the paper was one which invited questions. He noticed that the author, at the very start, remarked that the broad facts of the situation were known to all, and there was fortunately no dispute about them. Then he went on to say they were all agreed that sales of sulphate of ammonia in the British Isles were not nearly as large as they could, and should, be. No doubt, they would all assent to this. It was a short, but very pregnant statement, and one which it was unfortunate to have to make. The best nitrogenous manure, he believed, was the one commonly called sulphate of ammonia, and produced so largely in this country; but when Mr. Speyer went on to say they all knew that nitrate of soda, cyanamide, and Norwegian nitrate of lime were rapidly increasing, he would like to ask a question or two on the point. He did not know how Mr. Speyer meant to show them that nitrate of soda had increased. Did he mean that new deposits had been discovered; or, if he referred to the manufacture of nitrate of soda, was anyone attempting to carry out a process of this sort, which was the only other way of increasing the supply. It would be remembered that Sir William Crookes some years ago—he thought it was when President of the British Association—drew attention to the matter by means of panic statements about the decrease of nitrates, and induced Lord Rayleigh to make experiments with a view to finding electric processes by which free nitrogen and oxygen could be combined, so that it would be easy to proceed with the production of the acids. Then Sir William Crookes stated that, if electric current could be made for one-seventeenth of a penny per Board of Trade unit, nitrate of soda could be manufactured at £5 per ton. An unfortunate tragedy came out of this. Very many patents were started at the time; and among them was a very notable one worked by Messrs. Bradley and Lovejoy, who had the water power of Niagara for running it. They were no mean men at the work. He did not know exactly at what price the electric current was produced; but, at all events, he knew the potential was as high as 10,000 volts. This had gone out of existence; it ran for fifteen months. Therefore, he wanted to know where the author got his increased production of nitrate of soda from. Now, in regard to cyanamide. He himself took some pains a short time back to find out where this was produced; and he discovered it was made chiefly in an establishment near Rome, just in the hills above the city, because there was the advantage to be had of water power there, and also because it stood side by side with a calcium carbide manufactory. Though these establishments were in the names of Italians, it had been found since the war broke out that they were being run by Germans. The amount of cyanamide produced was not great. Other establishments had since been put up—one, he thought, in Savoy, another in America, and there was an establishment in Norway. He would like to know what their output was, and also whether the author had inquired of any agriculturist or any authority on plant nutrition as to what was the opinion held regarding the value of cyanamide as a manure. All he (the speaker) could say, treating it from the scientific side, was that their proposal was that an electric horse power would

fix theoretically 772 kilogrammes of nitrogen. Their practice to-day was 300 to 330 kilogrammes—less than half their promise. He knew they also promised to turn out 35 per cent. nitrogen. In sulphate of ammonia, they reached 20 to 21 per cent., and probably more; but the practice of these other people was below that, for they were only sending out 20 per cent. Then there was what was referred to in the paper as the nitrate of lime process. He happened also to know the results of working this. There was an establishment in Norway now using the patents of a very celebrated man, Berkeland, who had calculated that by his process he would give—35 per cent. or 20 per cent.? No; 13 per cent. Whether or not this was being done, he was unable to say; but it was stated that the stuff could be sold at £8 per ton. If they took the two values, nitrogen for nitrogen, this would represent nitrate of soda at about £10 a ton. Wonderful things were said in papers, and even at scientific meetings; and therefore it became necessary sometimes to inquire into these statements, and see whether they were really quite as wonderful as they seemed. This was what he was now endeavouring to do. In 1912, the total production at this factory in Norway was 20,000 tons per annum; and the plans for its extension showed that it was intended to bring it up to 36,000 tons a year. In view of what he had said, he would like to know from the author what evidence he had of the increase in production hinted at in the paper. To go back to the German production. The synthetic sulphate of ammonia which Germany was producing had only taken its present form, and its present great increase, since the outbreak of the war—for a very obvious reason, which he need not dwell upon. As to what the actual results were, he was quite unable to say; but he would like to know from whom Mr. Speyer had obtained the test of 25 per cent. He (Mr. Canning) had read the German accounts of the process, and knew what they had claimed for it; but he wanted to know whether there was any reliable test. With reference to the question of their approaching the merchants, this was all very well. The time at the disposal of the meeting was too short to go into the whole of the matter; but he would like to know whether the merchant was supposed to push the sulphate of ammonia with a farmer, whether he knew how to use it or not. It was a great misfortune for the whole industry that, having the best nitrogenous manure in the world, the county councils—who talked about education and spent money so largely upon it, and who had advising them in their position of directors of agricultural instruction, some of the best agriculturists to be found in the whole kingdom—had taken no steps to teach farmers the right use of sulphate of ammonia in agriculture. He would like to know how it was that, this sulphate of ammonia being a British article, steps had not been taken before the war to teach the farmers of this country how to use it. They were often employing it most ignorantly to-day. Many of them would use the sulphate without troubling as to whether or not the soil contained the ingredients necessary to make it effective; and the result could only be failure. In other cases they could use it until they had exhausted the lime, and would not replace it, not knowing the elementary principle involved. Therefore they wanted the farmer instructed, before the merchant was going to drop sulphate of ammonia down at the door of a man who probably did not understand it. This question was of the greatest importance. He was quite at one with the author that there was nothing needed more in this country than the promotion of home consumption ["Hear, hear."]; but they ought surely to do it thoroughly well. He was rather curious, too, with respect to this question of the 25 per cent. test, as against 24¾ and 24 per cent. He did not at all object to using the 25 per cent.; but he would like to know why a consumer, if he was now getting 24¾ per cent., should be so anxious to get the other ¼ per cent., which only represented ⅛ per cent. in nitrogen. This was a point which had aroused his curiosity, but not his opposition. It must be a hungry bacterium indeed that required this small modicum of nitrogen that seemed to do so much and to make such a difference. He hoped Mr. Speyer would not consider that he was criticizing either him or his paper unfavourably. He was with him in the view he desired to bring forward to-day; but he wanted to let the people generally know that they ought to be, through the public councils of the country, supporting their own industries, and that one of the most important of these industries was in connection with the subject they were now discussing. It was a matter which involved one of the greatest advantages to the nation at large, because they would be increasing the nation's food—a vital question at present, and one which would become of still greater importance as time went on. [Applause.]

Mr. W. C. Jackson (Neath), referring to the author's remark about sulphate of ammonia in Scotland, said he himself came of a farming stock; and his own home, the county of Fife, was, he thought, the one in this country which went in mostly for intensive cultivation. At each of the auction markets in the two centres, the corn merchants canvassed farmers regularly for sales of sulphate; and knowing as he did a number of gas-works in that part, he thought he could say they got rid of practically the whole of their output directly at these auction markets. In a place like Fife, with so much intensive cultivation practised, they got every bit from the land; and there was not a more contented set of farmers in the kingdom than there.

Mr. W. B. Mimmack (Pembroke) thought they were to be congratulated upon the fact that the paper had brought forth Mr. Canning's remarks. That gentleman had hit on the real difficulty when he said that lack of education stood in the way of the use of sulphate of ammonia to the extent that it ought to be employed. The knowledge of its capabilities was far greater among foreign nations—nations as far distant as Japan—than among British farmers, so many of whom were ignorant of its uses and showed inability to properly apply it. Mr. Canning said it was very important that the public institutions of the country should take this matter up, and include it in their educational syllabuses, so as to instruct the farmers and the people generally in the methods of application. But why had not the producers done this? Surely, it was up-against the producers to make this provision, and to see that the farmers were properly instructed in the use of the sulphate. He remembered talking a few years ago to a gas manager who had gone through a course as an agricultural chemist at one of the colleges. He manufactured a small quantity of sulphate—he believed about 40 tons a year—and he made up his mind that he would get rid of it entirely locally. He had a man on the works who understood how to apply sulphate; and whenever he sold the material to a local farmer, he sent this man out to apply it under the best conditions. Before very long, he was selling 150 tons a year, in his immediate neighbourhood, and had to go out and buy 110 tons to meet the demand.

Mr. Speyer, on rising to reply, thanked the members heartily for the kind reception accorded to his paper, and also for the extremely instructive criticism passed upon it. With regard to the lack of education of the British farmer, and the question asked as to why producers did not do anything to overcome this, the answer was that they had. Ever since the Sulphate of Ammonia Committee was formed, producers had been contributing a larger sum every year towards educating the farmer. This had been the work of the Sulphate of Ammonia Committee, which was now amalgamated with the Sulphate of Ammonia Association. They fully realized the importance of this, and intended to continue scientific propaganda on a larger scale and with increased energy. But they did feel that the commercial side of the question was not receiving sufficient attention, and were convinced that one of the reasons why more sulphate was not sold in this country was that producers would not take the trouble to increase their sales. The interesting increase in sales effected at a small producer's works of which they had just heard was really an illustration of what he meant. That was to say, the small producer had plenty of time to go about in a good agricultural district and induce farmers to buy sulphate; but large producers had not time, and could not be bothered to do it. The President had raised a point about 10s. a ton not being sufficient inducement for the merchants. When the Association suggested this figure, they made inquiries among large factors, and came to the conclusion that, at any rate for the present, this would be an inducement to them to undertake the business. As to the success which had been achieved in Scotland owing to selling through merchants, he had no precise figures; but inquiries had led them to suppose—and he was glad to have found support for the supposition at the meeting—that, owing to this encouraging of the merchants in Scotland, more sulphate was applied, comparatively speaking, than was the case in England. Mr. Canning had raised a very interesting question with regard to nitrate of soda. The reason of the increase in production of this commodity was to be found in the improved methods of manufacture. Owing to these improved methods, grounds which it was not possible to work in previous years were being dealt with, and he might say that there was a proposal now before the Nitrate of Soda Committee by which they hoped to increase the annual production of nitrate from 2,700,000 tons to some 5,000,000 tons. Whether this would be accomplished in actual practice, he did not know. What he had said here applied entirely to Chili. As regarded cyanamide, important factories in Dalmatia produced this; and great developments had taken place in Germany since the war. As to the suitability of cyanamide and nitrate of lime as a manure, experiments were being conducted; and he had lately spoken to several agricultural chemists, who seemed to think that on certain soils quite as good results could be achieved as with sulphate of ammonia. Mr. Canning further asked whether he had verified the test of 25 per cent. with synthetically produced sulphate. Before the war, such sulphate of ammonia was bought and sold in this country; and he had tests in his office which were made by recognized English chemists, and also independently by English manufacturers, to whom he sent sealed samples, and they absolutely confirmed that the salt tested 25 per cent. As to the question of the preference for 25 per cent. sulphate of ammonia, as against 24¾ per cent., the fact was that this German production was guaranteed 25 per cent., and it would therefore be preferred to 24¾ per cent. It was purely a question of supplying the demand.

The President proposed a very hearty vote of thanks to Mr. Speyer for coming down and reading his paper.

This was seconded by Mr. Kenshole, supported by Mr. Canning, and carried with applause.

Toluol.

The President then asked Mr. J. H. Canning, who, he said, had done so much in connection with toluol recovery, if he would say a few words in the regretted absence of Mr. John Bond.

Mr. J. H. Canning (Newport), responding to the invitation, informally gave the members some very interesting particulars regarding the subject.

Place of Next Meeting.

It was resolved that the question of the place for holding the next meeting should be left in the hands of the Council to decide.

Thanks to the Company.

Mr. Madden, proposing a vote of thanks to the Chairman and Directors of the Rhymney and Aber Valleys Gas and Water Company, for the use of their offices, in which to hold the meeting, and for the hospitality they were about to enjoy, said he had one regret in doing so—and this was that they had not with them Colonel Fisher. He knew that when this meeting was arranged some time back, Colonel Fisher was in high glee, and hoped to meet the members on the occasion. This, however, was not to be, unfortunately.

Mr. F. C. White (Blaenavon) seconded the vote, which was heartily accorded.

Luncheon.

At the close of the business meeting the members adjourned to the Boar's Head Hotel, where they were the guests at luncheon of the Chairman and Directors of the Rhymney Company. The chair was occupied by Mr. J. P. Jones (the General Manager and Secretary), who expressed regret that neither the Chairman nor any of the Directors could be present to welcome the visitors.

Mr. Hazell (after the Loyal Toast had been honoured) proposed the "Wales and Monmouthshire Institution," coupled with the name of Mr. Branson. The Institution, he understood, was now about ten years old. They would agree that it was a very sturdy infant, and had accomplished great things. It had united together in one body all, or nearly all, of those engaged in South Wales and Monmouthshire in the work of producing the principal illuminant of the times. The Institution had had the advantage of being led by capable men. So far as Mr. Branson was concerned, there was only one feeling—that, however well the office of President had been filled in the past, he had not dimmed the lustre of the office, but had if anything added to the importance of the position. The Institution had done a great deal for the different undertakings connected with it, and it had done a great deal for the consumer. It was an undoubted advantage that the members should combine together to impart their knowledge and experience one to another. Benefit was bound to result on all sides. To Mr. Branson they might offer again, as they offered once before, their congratulations that he had come safely through a very critical and a very exciting time. Considering the effects of the shelling of Hartlepool, he could at any rate expect that, having gained so little by their great enterprise, the "valorous" Germans were not very likely to pay the place another visit.

Mr. Branson, in response, said it was gratifying to find, even in these times, when managers were naturally reluctant to leave home, they could gather together in such strength as they had that day in so out-of-the-way a place as Caerphilly. The manager of even the smallest undertaking possessed experience and knowledge peculiar to himself; and if he could be induced to pass this on, he was benefiting the industry. There never was a time when it was more necessary than now that they should be united. The Commercial Section in the North of England had been a perfect god-send in keeping them through this strenuous period. Things were almost straight again at Hartlepool. It had cost them £4000 to repair the largest holder, and the work was nearing completion. There was still another to make permanent repairs to. The Government had paid them £7000 odd towards the damage; but this, of course, would not cover the cost. He hoped to remain a member of the Institution as long as they would allow him to do so. He looked back with great pleasure, and a tinge of regret at having left the district, upon the very happy time he spent in South Wales.

Mr. Thomas Canning proposed health and prosperity to the Chairman and Directors of the Rhymney and Aber Valleys Company, their Manager, and their Engineer. Mr. Jones, he said, was a very able, painstaking, hard working, and conscientious man in every respect; and he was sure that in his hands the undertaking would continue to progress as it had done under the care of his predecessor. They had been received at Caerphilly in a manner which had given satisfaction to all.

Mr. Jones, replying, said the Chairman and Directors, though unavoidably absent, hoped the visit of the members would prove both pleasurable and profitable. Personally, he would rather the visit had been deferred until the new works had been completed and brought into use; but he well knew his late Chief was very anxious that during his occupancy of the presidential chair the members should visit the district in which he had so successfully laboured for many years. Therefore, he (the speaker) would presently take the President down and show him round the works which he (Mr. Branson) had so largely designed and which he had had so big a hand in constructing.

The New Gas-Works.

The party then proceeded to inspect, under the guidance of Mr. Jones and Mr. B. Grainger (the Engineer), the works which are now in course of erection. As the President pointed out in his address, the idea has been to centralize the manufacture at one new works at Caerphilly—stopping-down the old works there, and those at Hengoed and Pontlottyn. For some time past, the Company have been taking gas from the coke-ovens at Bargoed; and this source of supply has been found very satisfactory.

The excellence of the site and of the lay-out of the works was commented upon by the visitors. The coal gas will be made entirely by vertical retorts; the installation which is in course of erection being of the Glover-West type, of a capacity of 500,000 cubic feet per day, with a steel-framed coal-store to hold 1200 tons. There is also being put down an engine-house, to contain two Bryan-Donkin steam-driven exhausters, each of a capacity of 40,000 cubic feet per hour.

The only part of the manufacturing plant at the works which has so far been used is a Humphreys and Glasgow carburetted water-gas set, to produce 400,000 cubic feet of gas per day, complete with tar-extractor. Among the other plant on the works, there is a boiler-house containing two 18 feet by 6 feet Cornish boilers, a 20,000 gallon capacity underground tar and liquor well, annular and water-tube condensers, a Livesey washer, a tower-scrubber, four purifiers 20 feet square with self-sealing lids, a Braddock station-meter, a spiral-guided holder in steel tank of a capacity of 500,000 cubic feet, a governor-house and governor, a laboratory and photometer-house, and a works manager's house. A compressor of a capacity of 35,000 cubic feet per hour, for the purpose of ultimately delivering gas up the valley, has been fixed in the building which contains the blowers, exhausters, and oil and feed pumps belonging to the carburetted water-gas plant.

The whole of the buildings are in rough-course rubble stone work; the quoins, over-sailing courses, and all openings being finished off in blue bricks, and designed with a view to uniformity of appearance.

In laying-out the works, due regard has been had to future necessary extensions; and all connections have been so arranged that additions can be made without interfering with the operating of the plant. The site, of about 5 acres, is close to the railway, from which a siding into the works will ultimately be put down. The new works would by this time have been further advanced than is actually the case, had not the different contractors experienced difficulty in obtaining materials and labour, owing to the abnormal conditions prevailing.

A visit to the Castle ruins and tea—again as the guests of the Company—brought to a close a thoroughly successful day.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Coal Prices (Limitation) Act, 1915.

Sir,—On behalf of the members of the Lancashire Commercial Section, we have communicated with the Board of Trade, *re*

(*a*) The basis price for estimating the revised charge as allowed by the above Act.

(*b*) The legality of increasing waggon hire charges on existing contracts.

The following replies have been received; and, with the permission of the Board of Trade, we forward same for publication, as the matter is one of considerable interest to gas authorities throughout the country.

S. Meunier, Chairman.
S. E. Halliwell, Hon. Secretary.

Littleborough, Sept. 29, 1915.

[Enclosures.]

The enclosures referred to in the above communication are two letters, addressed to Mr. Halliwell by Mr. W. F. Marwood, writing from the Board of Trade (Railway Department), Whitehall Gardens. They are as follows:—

Sept. 20, 1915.

Sir,—In reply to your letter of the 9th of September, with regard to the question what is the corresponding price in the case of deliveries of "excepted coal" in respect of which notice has been given to the owner of the coal at the pits' mouth under the provisions of section 4 (2) of the Price of Coal (Limitation) Act, I am directed by the Board of Trade to point out that the question is one which the Board may be called upon to determine under section 3 (1) of the Act when referred to them by a Court of Law; and they must not therefore be understood as giving a final decision on the matter.

Subject to this, however, and apart from any special circumstances, it appears to them, after careful consideration, that, in the case of the coal above referred to, the corresponding price after the 29th of October will not be the price of coal sold otherwise than under contract, but will be the price of coal sold under a contract corresponding to that under which the deliveries are being made.

A reply to the other points raised in your letter will be forwarded to you shortly.—I am, &c.,

W. F. Marwood.

Sept. 22, 1915.

Sir,—With further reference to your letter of the 9th of September, inquiring whether the charges for waggon hire referred to in section 2 of the Price of Coal (Limitation) Act can legally be charged on contracts entered into before the passing of the Act, I am directed by the Board of Trade to say that, while they are not in a position to decide the legal question whether the giving of notice under section 4 (2) of the Act enables contractors to make increased charges for waggon hire, they are of opinion that the giving of such notice would not appear to affect any terms of contract other than the price of coal at the pits' mouth.—I am, &c.,

W. F. Marwood.

Impurities in Crude Gas.

Sir,—May I question the accuracy of the figures quoted on p. 700 of the "Journal" for Sept. 28 (*re* H_2S and CS_2 in crude gas), which figures form part of the paper contributed by Mr. Bell, of Derby, to the International Gas Congress at San Francisco?

I should like to suggest that they should read as follows:

SH_2, 700 to 1000 grains per 100 cubic feet.
CS_2, 30 to 70 grains per 100 cubic feet.

Brockley, S.E., Sept. 29, 1915. J. Hewett.

[The abstract referred to by our correspondent was taken, as stated, from the official abstract of the paper, as appearing in the "American Gas Institute News."—Ed. J.G.L.]

MISCELLANEOUS NEWS.

ALLIANCE AND DUBLIN CONSUMERS' GAS COMPANY.

Half-Yearly Meeting.

The Half-Yearly Meeting of the Alliance and Dublin Consumers' Gas Company was held at the offices, D'Olier Street, Dublin, last Thursday—Mr. JOHN MURPHY (the Chairman) presiding.

THE CHAIRMAN'S ADDRESS.

The CHAIRMAN, in moving the adoption of the report [see "JOURNAL," Sept. 21, p. 658], said he wished, in the first instance, to express his deep regret, and that of his colleagues, at the loss sustained since the last half-yearly meeting through the death of their friend and fellow-Director, Mr. Tresilian, which occurred very unexpectedly. He was a man of exceptional business ability, who took a great interest in the affairs of the Company; his best exertions being always at its disposal. He begged, on behalf of himself and the Board, to tender respectful sympathy with Mrs. Tresilian and family. They would have observed from the report that Alderman Cotton, M.P., had resigned his seat on the Board; thus severing a connection which had extended over more than forty years—forty-seven years, to be correct.

COMPARISON OF ACCOUNTS.

On the last two occasions when he had the privilege of addressing the shareholders—twelve and six months ago respectively—he mentioned that, owing to the different form in which the statement of accounts was presented, comparison with the corresponding previous periods was impossible. This, however, no longer existed, and with the accounts now submitted, being identical in form with those of the corresponding period of 1914, comparison could be made as regarded every item; and he had no doubt but that such comparison had already been made by many of the shareholders, in whose hands the accounts had been for some considerable time. The total expenditure on capital account for the half year amounted to £8369, which included an item of £2225—a payment on account of the new coal-handling plant. There only remained the balance of £560 to complete the total cost of this plant. There had also been an expenditure during the half year of £1610 on the new 30-inch main in Barrow Street, to which he would refer later, when dealing with the works. He thought the other items of capital expenditure spoke for themselves. There were three deductions from capital expenditure for depreciation and sales of old material, amounting in all to £8187, leaving only £182 to be added to capital expenditure during the half year, which was satisfactory.

REVENUE ACCOUNT.

Turning to the revenue account, it would be observed that the revenue profit for the half year showed a marked increase of no less a sum than £35,398 over that of the corresponding half year. This large increase in profit was largely attributable to a reduction in expenditure on coal and oil of £10,239—notwithstanding the increases in the market price of the former commodity. The reduction had been effected by favourable contracts concluded some time since. There was also a substantial decrease in the charge for repairs of works, amounting to £5886. This had been achieved without any decrease in efficiency. A saving of £1980 on repairs of meters, and £2801 on repairs of stoves and fittings, had also been effected. In the former case, this was largely due to the alteration in the system hitherto in force, and, in the latter, to the transfer of the stove-repairing shop to a more suitable and very economical site on the works. There had also been a reduction in expenditure of £1062 on "Secretary, Accountant, and clerks." No expenditure had been incurred in parliamentary opposition or in fees for experts' reports; and these items accounted for a reduction of £3556 as compared with the corresponding period of 1914. It would also be noticed that no charge appeared against the revenue of this half year in respect of Officers' Superannuation Fund. This had resulted in a saving of £750; but it was the intention of the Directors to resume contributions to the fund at an early date. A war bonus had been granted, and certain allowances had been made to dependants of employees who had joined the Army and Navy, at a cost of £804 for the half year. On the credit side of the revenue account, while increases in certain directions had been obtained, there was a decrease in the sales of gas to ordinary consumers for the half year amounting to £2285. This was almost entirely due to restrictions imposed by the authorities in respect of licensed houses. It was gratifying, however, to point out that the income from sales of gas to prepayment consumers showed an increase of £1381; while the public lighting remained at about the same figure. The income from residuals showed a satisfactory increase of £6417 in respect of sales of coke and breeze; £2568 on tar; and £1318 on sulphate of ammonia. Passing on to the net revenue account, it would be observed that a further amount had been written off ordinary and prepayment meters, amounting to £4083. and that a year's contribution of 10s. per cent. (or £8119) on the capital had been allocated to the special purposes fund.

SPECIAL PURPOSES.

The special purposes fund showed that they had now £16,240 under this head available for certain purposes. The fund had been created since that time twelve months ago. The three items—bills payable, bank overdrafts, and sundry creditors—amounted at June 30, 1914, to £128,162, whereas the corresponding items this half year amounted only to £70,194—a decrease of £57,968. On the other side of the balance-sheet, the stocks on hand showed an increase of £9181. It was a matter of satisfaction that the Directors were able on this occasion to recommend the payment of the maximum statutory dividend—namely, £5 2s. 6d. per cent. per annum, less income-tax—without having been, so far, obliged to increase the price of gas.

WORKS AND PLANT.

With regard to the works, he had already mentioned in passing the new coal-handling plant, and the new 30-inch main, to which he referred at the last half-yearly meeting. Both were completed and in operation. The first cargo dealt with by the former was on May 23 last, so that the accounts under review had only benefited slightly by its use. The plant had fully realized anticipations; and they looked forward to a substantial reduction in the expense of handling the coal. The estimated cost of the plant—namely, £4000—had not been exceeded. The coal was unloaded by means of grabs, operated by a travelling crane, running on a double line of rails fixed on an overhead gantry. It was then delivered from the grabs into an overhead hopper, underneath which there was an automatic weighing machine. After being weighed, the coal was delivered on to a push-plate conveyor, and passed directly into the coal-stores. The wages cost per ton of coal so handled averaged under 1½d. per ton, and, making liberal allowances for the cost of repairs and depreciation, interest on capital, &c., the cost would not exceed 3d. per ton. This, they would easily understand, represented a very substantial saving on the old method of handling the coal by means of tip waggons; and, as far as possible, the greater part of their coal would be eventually dealt with by the new plant. He took the opportunity of mentioning that they had at present over 25,000 tons of coal in stock, in anticipation of the winter's needs. They fully realized the necessity of keeping considerably larger stocks of coal and oil now than under normal conditions. The matter was constantly before the Board, and received every attention.

THE NEW MAIN AND PRESSURE STATION.

As to the laying of the new 30-inch main, this was a work entailing very considerable difficulties, owing to the presence of water in the excavations and the making of the connections to the Clayton and Alliance holders. He was glad to say, however, that these difficulties were successfully overcome, at a cost not exceeding the estimated expenditure. The result of the laying of this main was a marked improvement in the gas supplied to the city. A set of charts had been furnished that showed the improvements intimated. He was glad also to state that the reconstruction of the pressure station was now completed, and that the station governors were working satisfactorily. This, again, was a work causing much anxiety, as they would realize when he said it included the removal of the old station governors and the installation of six new governors—five of which were 24-inch diameter and one 18-inch, together with the coupling up to the 30-inch trunk main and to the other holder connections. The work was successfully carried out by Messrs. J. & J. Braddock, of Oldham, under the personal attention of their representative, Mr. Taylor.

TOLUENE PRODUCTION.

Acting immediately on the suggestion and recommendations of Lord Moulton's Committee on explosives, the Directors took the necessary steps to increase the production of toluene. The results, under the present abnormal conditions, were gratifying—although not, perhaps, of financial benefit. Nevertheless, the Company's obligations in the matter of candle power had been fully maintained, and it was satisfactory to think that they were contributing their quota in a direction so pressing.

DISTRIBUTION.

The Company's distribution returns had at times been adversely criticized; but it should be remembered that Dublin had special difficulties to contend against, with long lengths of mains and services, a huge area to cover, a limited number of consumers per mile of main, and a small consumption per consumer. However, with a view to improving a department which admittedly bore unfavourable comparison with undertakings more favourably situated, the Board had appointed a Distribution Committee, consisting of some of their members, with a view to assisting the distribution officials in their work of re-organization; and they anticipated good results.

TRIBUTES TO OFFICIALS.

He could not conclude his remarks without paying a special tribute to their Consulting Engineer, Mr. Newbigging, whose efforts in placing the works on a proper basis had been unremitting, and, he was very glad to say, uniformly successful. He also wished to refer to the able services rendered by their Secretary, Mr. W. J. Grey, and their Works Manager, Mr. H. Dumbleton, in their respective departments; and to the loyal assistance given by every member of the staff.

RECOGNIZING THE SERVICE OF THE ENGLISH DIRECTORS.

Referring to the special business to be brought forward, in accordance with the notice convening the meeting, the Chairman said that a number of prominent shareholders having expressed the view that special recognition should be made to the services rendered by those Directors who resided in England, a motion in accordance with the notice would be proposed. He wished to state, on behalf of himself and the Directors not concerned, that they were in entire sympathy with, and approval of, the course proposed. Mr. Dickens, Mr. Bond, and Mr. Davies were gentlemen having important business interests on the other side of the Channel; but, notwithstanding this, they had been unremitting in their attendances at the regular meetings of the Board during the past twelve months, in spite of the inconvenience of crossing to Dublin in the depth of winter. They had also, on several occasions, spent days together in Dublin, closely examining the various departments of the Company's business; and, on the other side of the water, their assistance—especially as regarded purchases of coal—had been of great value. He trusted, therefore, that the motion, when proposed, would be unanimously adopted.

AN ENGLISH DIRECTOR'S REMARKS.

Mr. AUGUSTINE BOND, in seconding the motion, desired to identify himself with the remarks of the Chairman. He ventured to say at once that he regarded the position disclosed by the accounts as particularly satisfactory, and, if comparison was made with previous half years, he thought they would agree that it was most gratifying. The position with them was, he believed, entirely unique, because, in spite of increased costs of materials and wages in all directions, they had, without transferring these burdens on to the shoulders of the consumers, substantially increased their revenue profit, enabling them to pay the maximum statutory dividend. They did not expect that their finances would be materially affected by the Price of Coal (Limitation) Act, 1915, as only a small proportion of their requirements came within

the retrospective scope of this Act; and, moreover, the contracts were made at such prices that there was every likelihood of the collieries and the contractors concerned being able to justify them.

THE SHOW-ROOMS.

After very careful and anxious investigation, the Directors had decided to close the Grafton Street show-rooms; and they were pleased to inform the stockholders that they had relet the premises at an advantageous rental. They intended to erect up-to-date show-rooms adjoining the Head Office in D'Olier Street, which they considered to be a more convenient site, and more readily accessible to consumers visiting the offices. The cost of these alterations would amount to £1500. They had also opened show-rooms at Kingstown. As shareholders were aware, they had already vacated the premises in Hawkins' Street formerly used as a stove-repairing department. Negotiations were in progress for the letting of these premises for a term of years, at an adequate rent. They desired to point out that there was a very suitable site for trade or business, with a frontage of over 80 feet on Sir John Rogerson's Quay and 280 feet on Cardiff Lane, part of the works site at present used as a coal-store; and they would be happy to treat for the tenancy of these premises, which, in every respect, would lend themselves to any business requiring a deep-water berth.

PRICE REDUCTION.

In recommending payment of the maximum statutory dividend, he remarked, as previously mentioned by the Chairman, that this absorbed the sum of £39,766. This amount, as it would occur to them, would increase the bank overdraft to a figure of £64,000. This, however, would be materially reduced as time went on. As mentioned in the report, they had in the Bray district made a reduction of 5d. per 1000 cubic feet in the price of gas, and they had also put into operation a graduated scale showing considerable reductions to consumers using gas for power and manufacturing purposes. This reduction, they were confident, would encourage manufacturers and traders to extend their businesses on satisfactory and economical lines.

BACK-DIVIDENDS.

He understood some doubt existed in the minds of certain shareholders with reference to the question of making up arrears of back-dividends; but he felt sure these shareholders had overlooked the fact that this was not a maximum dividend company, but a company working under the provisions of a sliding-scale, and, therefore, in their case, there could be no question of making up any arrears of dividends in past periods, as they were precluded from so doing by the Act of Parliament.

CAPITAL EXPENDITURE.

The Chairman had referred to the fact that they had only added to capital expenditure this half year to the extent of £182. The Directors felt confident that, during the present half year, there was at least a possibility of the present figure of capital expenditure being reduced, rather than any sum added to it. This, he thought, would be regarded as satisfactory, considering all the circumstances. It was interesting also to note in this connection that, whereas on the 31st of December, 1913, the capital account was overdrawn to the extent of £68,412, it now showed a debit balance of only £50,946. They would see from this that the amount written off, and the sales of old material, had substantially exceeded the capital expenditure during the last eighteen months. In conclusion, Mr. Bond referred to the recent death, in action, of Lieut. Nesbitt, 6th Battalion Dublin Fusiliers, who had for 27 years been a prominent and much-valued servant of the Company, and extended sympathy to his family.

The motion was unanimously passed.

THE DIVIDEND.

On the motion of the CHAIRMAN, seconded by Mr. J. L. SCALLAN, a dividend of £5 2s. 6d. per cent. per annum, less income-tax, was declared.

ENGLISH DIRECTORS' REMUNERATION.

Mr. M. K. ROCHE moved: "That a sum of £1000 be divided among Messrs. Dickens, Bond, and Davies, as remuneration for their past special services to the Company, and that the sum available for the remuneration of the Directors be increased by the provision of a further sum of £500 per annum." He said he was sure the shareholders felt under a great obligation to the gentlemen from England, whose influence and ability had been used to such excellent purpose in bringing the Company to its present state of prosperity. He contrasted the present position with that which had previously existed, alluded to the time and trouble involved in re-organization, to the efforts of the officials, including Mr. Grey, in support of the Directors, and to the efficiency with which the work of all departments was now being carried out. The shareholders, he said, should not—and he knew they would not—grudge the recognition that was proposed of the services of the Directors from England, who had placed the concern in a position which they had not looked to see it in in so short a time. He urged that it was their duty to encourage the Board in the enterprising methods which had been adopted, and he hoped that they would continue to have such satisfactory reports and such excellent results.

Mr. G. W. NORMAN, in seconding, endorsed the remarks of the previous speaker, and observed upon the small attendance of shareholders as a hopeful sign—a sign that confidence was reposed in the Board—and that the period of prosperity which had arrived would continue. He joined in the tribute to the officials and to the staffs in all departments, and referred in felicitous terms to Mr. Grey's ability and usefulness in the working of the undertaking.

The motion was passed unanimously.

ACKNOWLEDGMENTS.

Mr. W. H. DAVIES acknowledged the kindness of the shareholders on his own behalf, as well as on behalf of Messrs. Bond and Dickens. He assured them that it had been a great pleasure to them to come there and help in doing all that could be done to promote the success of the Company and its works. He wished to say that there was no foundation for the rumour that they (the Directors from England) intended to leave the concern—that they were not going to continue the work in which they had been engaged. They intended to remain, and it would be their duty, as it would be a pleasure to them, to devote their best energies to the interests of the shareholders. He also joined in the tributes paid to the officials and staff, and said they placed the highest value on the co-operation that had been of so great assistance to them and on the goodwill extended by all.

Mr. GREY expressed his gratitude to those who had spoken in so kindly a spirit of himself. He was greatly pleased, indeed, that the results of the working had been so satisfactory. His own services would have been of small importance, after all, he felt, but for the manner in which he was supported by all the departments. He had had the most loyal help from all—from the higher officials to the workmen in even the very minor grades. It had been a pleasure to him to work with them; their devotion to duty and anxiety to promote the common interest surpassing, indeed, anything he had ever experienced. He added that he found Irishmen extremely loyal to work, and that he had only to make a suggestion and it was carried out with every promptitude.

VOTE OF THANKS.

Thanks were afterwards formally voted to the Chairman, Directors, officials, and general staff—members of the shareholding body declaring their gratitude for all that had been done, and stating that they looked forward to continued good results.

BRITISH GASLIGHT COMPANY, LIMITED.

Half-Yearly Meeting.

The Ordinary Half-Yearly General Meeting of the Company was held last Wednesday, at the London Offices, No. 11, George Yard, Lombard Street, E.C.—Sir CORBET WOODALL, D.Sc., in the chair.

The SECRETARY (Mr. A. W. Brookes) read the notice convening the meeting and the Directors' report. The accounts and the financial statement referring to the Norwich station were taken as read. The Auditors' report and that of the Norwich Corporation Auditor were read. The report of the Directors was as follows:

The Directors submit the half-yearly accounts of the Company to the 30th of June last, as examined and certified by the Auditors, who have also vouched for the correctness of the investments held by the Company.

The available profit is £33,574 6s. 1d., after deducting the following sums: Income-tax, £3628 13s. 4d.; Hull debenture interest, £2015 12s. 6d.; Norwich debenture interest, £1693 2s. 6d.; Potteries debenture interest, £627 1s. 8d.; Trowbridge debenture interest, £156 15s. 5d.; interest on debenture stock, £2150—total, £10,271 5s. 5d.

HULL.—The gas-rental shows a decrease of £32 as compared with the corresponding period of 1914; the price of gas having been increased from 1s. 10d. to 2s. 1d. per 1000 cubic feet from the 1st of April. Coke shows a decrease of £1440; tar and tar distilling, £1916; and ammoniacal liquor and sulphate of ammonia, £402—these decreases being principally attributable to the lesser quantity of coals carbonized. Coals have cost 16s. 10d. per ton, as against 15s. 10d. Coke has realized 11s. 9d. per ton, as against 11s. 5½d. The gas sold shows a decrease of 42,815,895 cubic feet, equal to 5·49 per cent. The quantity sold in bulk to the Corporation for the supply of the Old Town was 37,770,000 cubic feet; being 5,064,000 cubic feet, or 11·82 per cent., less than in the same period of 1914. Exceptional expenses have amounted to £3715; the principal item being £2000 on account of the reconsruction of No. 3 retort-house. After charging these against the half-year's revenue, the profit realized is £15,448 1s. 9d.; being £4893 2s. 8d. less than the parliamentary interest. The deficiency will be drawn from the reserve fund; leaving £15,913 15s. 9d. to the credit of that account.

NORWICH.—The gas-rental shows an increase of £736 as compared with that of the corresponding period of 1914, the price of gas having been the same—viz., 2s. 10d. per 1000 cubic feet, with reductions for gas used for manufacturing and other special purposes. Coke shows a decrease of £892, and tar, tar distilling, and ammoniacal liquor a decrease of £626. Coals have cost 21s. per ton, as against 19s. 1d. Coke has realized 17s. 8d. per ton, against 17s. 9d. Gas sold shows the small decrease of 84,154 cubic feet, equal to 0·03 per cent. The profit realized is £2351 2s. 2d. in excess of the parliamentary interest.

POTTERIES.—The gas-rental shows a decrease of £699 as compared with that of the corresponding period of 1914; the price of gas having been the same—viz., 2s. 6d. per 1000 cubic feet, with a rebate of 3d. for prompt payment, and special discounts to large consumers and consumers of gas for power purposes. Coke shows an increase of £594; tar, a decrease of £977; and ammoniacal liquor and sulphate of ammonia, an increase of £39. Coals have cost 14s. 3d. per ton, as against 13s. 10d. Coke has realized 10s. per ton, as against 11s. 1d. The gas sold shows a decrease of 7,035,617 cubic feet, equal to 3·36 per cent. The profit realized is £300 8s. 3d. less than the parliamentary interest.

TROWBRIDGE.—The gas-rental shows an increase of £469 as compared with that of the corresponding period of 1914; the price of gas having been the same—viz., 3s. per 1000 cubic feet, with discounts. Residual products show an increase of £435. Coals have cost 17s. 10d. per ton, as against 18s. 6d. Coke has realized 15s. 3d. per ton, as against 12s. 11d. The gas sold shows an increase of 2,503,228 cubic feet, equal to 7·26 per cent. The profit realized is £266 0s. 6d. in excess of the parliamentary interest.

HOLYWELL.—The gas-rental shows a net decrease of £23; the price of gas having been the same—viz., 4s. 2d. per 1000 cubic feet, with discounts. Residual products show an increase of £45. The profit realized is £315 7s.

The available profit, added to the previous balance of profit and loss, amounts to £107,191 4s. 7d. From this sum the Directors recommend a dividend at the rate of 10 per cent. per annum, with a bonus of 2s. 6d. per share, both less income-tax. The dividend and bonus will amount to £28,650 1s. 11d., and leave a balance of £78,541 2s. 8d.

The Directors who retire by rotation are Major-General William T. Corrie and Mr. Lewis R. Abbey-Williams; the Auditors are Mr. E. Knowles Corrie and Mr. William Cash. They respectively offer themselves for re-election.

EFFECTS OF THE WAR.

The CHAIRMAN, in moving the adoption of the report and accounts, said: At the close of the second half year of working under war conditions, I am glad to have a report so comparatively favourable to present to you. Generally speaking, circumstances have been against us. The cost of materials used, with the exception of oil, has been higher; the quantity of gas sold materially less; and the revenue from residuals less also. Greater expense has had to be met out of reduced income. The conditions at the various stations differ. At Hull, our

largest station, the output of gas has fallen by 5½ per cent. in the Company's district and by 12 per cent. in the Old Town. For the latter, we supply gas in bulk to the Corporation, who, in turn, undertake its distribution. The enemy air-raids have probably induced some inhabitants to sleep out of town. The restrictions upon public and outside lighting have been very stringent; and the trade of the City has doubtless suffered. In the months of July and August, the consumption was less by some 11 per cent.; but I am glad to say that there seems to be a turn for the better now. Notwithstanding these drawbacks, the profit for the half year has been better by £2000 than in the corresponding half of 1914, though still less by £4893 than the sum we are entitled to divide. There have been exceptional charges for renewals during the half year; but for these, the balance would have very nearly met the dividend.

THE POSITION AT HULL.

As I mentioned six months back, the capital expenditure at Hull has been very heavy recently, due to the reconstruction and enlargement of the works to meet a steadily increasing consumption of gas; and because of this, the charge for dividend has been largely increased. It is unfortunate that, having made this provision, the station should be the chief sufferer with respect to reduced sales occasioned by the war. As illustrating this, I may mention that in 1910 the output of gas at Hull was 636 million cubic feet; while in 1914—in four years—it had gone up to 780 millions. The capital had gone up by £86,000, and the charge for dividend had fallen from 6·5d. to 5·8d.; but in the last year the consumption fell by 43 millions, the capital by £40,000 nearly, and the capital per 1000 cubic feet increased by 2s. The interest rose to 6·6d., or from £17,000 in 1910 to £20,000. So that, while everything was perfectly right and proper until the current year, the falling away of the consumption has made the actual charge for dividend per 1000 cubic feet much higher. The reduction of gas-rental during the half year amounted to £3182. This was neutralized by an increase of price which took effect from the 1st of April, and brought in an additional £3150. The effect of transferring from the Hull reserve fund to the general profit and loss account the deficiency of £4893 will be to increase by this amount the balance remaining to the credit of profit and loss, as the half-year's earnings are sufficient without help to meet the dividend and bonus which it is proposed to pay.

SATISFACTORY RESULTS AT NORWICH.

The results at Norwich are very satisfactory, as they show a profit of £2350 more than the parliamentary interest. Although the full effect of the increased cost of coal and freight has not yet been felt, the charge against the half year has been considerable; for, in spite of the fact that the quantity of coal carbonized was 1260 tons less than in the corresponding half of 1914, the cost was £500 more. At last year's price it would have been £1200 less; so that there is a difference of £1700 against the working. The surplus profit will reduce the deficiencies of interest in past years, and is available for dividend. Troops have been billetted in Norwich, and the trade of the City was otherwise good.

POTTERIES AND TROWBRIDGE STATIONS.

In the Potteries the receipts were £900 less than in the same half of 1914; but the expenditure was £2800 less. The profit thus shows an increase of nearly £2000, and is only £300 short of the parliamentary interest. At Trowbridge, the half-year's profit shows a marked advance upon that of the corresponding half year, and is £266 in excess of the authorized interest. The quantity of gas sold has increased, and residuals have brought higher prices. Here, as at Norwich, the quartering of troops in the neighbourhood and abundant work for the Government have aided in producing the good result.

COAL AND FREIGHTS—THE OUTLOOK.

Over the whole undertaking the net decrease in the quantity of gas sold has been 47½ million cubic feet, or 3·64 per cent. Comparing the position of the Company, and of the gas industry generally, with what it was six months ago, there is room for congratulation. We have to acknowledge, and we do so gratefully, the prompt and efficient aid given by the Government when the conditions obtaining were brought fully home to them. First, the provision of interned enemy ships to carry coal to London helped considerably to abate the extravagant charges which were being made for freight. The help would have been greater had the Board of Trade resisted the temptation to make war profits when they became carriers. Secondly, by limiting the export of coal, the threat of famine was removed. I apprehend that at present the stocks held by undertakings through the country are rather above than below the normal. Thirdly, by the passing of the Price of Coal (Limitation) Act, we have been saved from the risk of prices so high as to be an insufferable burden to suppliers and consumers. The Act is not easy of interpretation, especially as some of the parties interested are not disposed to help an understanding. The intention of the Legislature is clear; but it may be necessary to seek in the Law Courts a definite pronouncement on certain points. But, meantime, we can be thankful that the Act has removed the nightmare which oppressed us a few months ago. We shall still have to pay high prices; but we know the limit, and shall be able to make arrangements accordingly. Further, the workmen, knowing that the owners have no longer unlimited power as to prices, will be more reasonable in their demands and their methods of enforcing them. We may hope to be saved the infinite shame of again seeing men standing idle whose best service is needed to secure the safety and triumph of their country.

THE DIVIDEND.

I expressed my belief when we last met here that the dividend and bonus then declared would be repeated; and the Directors are pleased, as I hope you will be also, to see that my expectation has been realized. What may be in front of us it is impossible to forecast; but we see no present reason for anxiety.

EMPLOYEES WITH THE FORCES.

The last report stated the number of employees who had joined His Majesty's Forces at 179; the number now stands at 235. At all our works material for the manufacture of high explosives is now being produced.

INCREASE IN THE PRICE OF GAS.

In view of the still increasing cost of gas manufacture, it has been found necessary to advance the charge to ordinary consumers at all the towns our Company supplies—viz.: Hull, 3d. per 1000 cubic feet; Norwich, 2d.; the Potteries, 6d.; Trowbridge, 5d.; and Holywell, 6d. to 4d. We hope soon to be able to reduce or remove these burdens, which we have been most reluctantly obliged to impose.

THE RECENT CAPITAL ISSUE.

In April last 2000 additional shares were offered to the proprietors at the price of £38 per share. Of these, 72 remain unallotted; and the Directors invite applications for them before Oct. 30. Allotments made before that date will carry dividend to Dec. 31. The Directors recommend the declaration of a dividend at the rate of 10 per cent. per annum, together with a bonus of 2s. 6d. per share, both less income-tax. This will require £28,650, and will leave a balance of £78,541.

Mr. FREDERICK WILKIN having seconded the motion,

Mr. J. CHAMBERLAIN, as a matter of interest, asked if any of the Company's stations had suffered damage from the recent air-raids.

The CHAIRMAN replied in the negative.

The motion for the adoption of the report and accounts was unanimously agreed to.

DIVIDENDS AND RE-ELECTIONS.

Moved by the CHAIRMAN, and seconded by Mr. FREDERICK WILKIN, a dividend at the rate of 20s. per share, and a bonus of 2s. 6d. per share, for the half year ended June 30, both less income-tax, were declared.

Proposed by the CHAIRMAN, and seconded respectively by Mr. R. S. GARDINER and Mr. WILKIN, Major-General William T. Corrie and Mr. L. R. Abbey-Williams were re-elected on the Board.

Proposed by Mr. KENNETH R. MACKAY and seconded by Mr. CHARLES WEBB, Mr. E. Knowles Corrie was re-appointed an Auditor, as was also Mr. William Cash, F.C.A., on the motion of Mr. HENRY PULLMAN, seconded by Mr. B. F. HARRIS.

VOTES OF THANKS.

Mr. PULLMAN said he regretted that he did not have any personal acquaintance with his colleagues on that side of the table; but he was sure he would be voicing their sentiments when he said that they were all deeply indebted to the Board, and especially to the Chairman, for the very lucid explanation he had given of an eminently satisfactory balance-sheet with regard to which there had not been a word of criticism offered at the meeting. From his experience over many years in the management of gas companies, the Chairman and his colleagues were to be congratulated on having brought forward such a satisfactory balance-sheet under adverse circumstances. The shareholders cordially thanked the Board and the staff for their very arduous and serious devotion to their interests during the past year.

Mr. RICHARD STEVENS seconded the motion, which was put and carried unanimously.

The CHAIRMAN, in responding on behalf of his colleagues and himself, said it was unnecessary to say that the Company had passed through a trying time and were not yet by any means out of the period when the same could be said. But they were pleased to have so good a report to present, which he hoped they would continue in a position to do. They would certainly do their best in this direction. The fact that they had been able to present such a good report was due very largely indeed to the manner in which they had been served by their officers at the different stations, and by their Secretary and his staff at home. He had spoken strongly about the obligations that they were under to their friend Mr. Brookes on more than one occasion, and all he could say was that the standard that that gentleman had set up long ago he had maintained thoroughly, and that a better Secretary no company could desire to have. With regard to the officers at the works—the commercial side as well as the engineering—their work had been of a most trying and absorbing character. The alterations in the values of what they had to buy and what they had to sell had been perplexing and difficult; but throughout they had done well. One had to be careful in comparing reports from the different stations not to set down the fact that one man had earned more than the necessary sum to pay the statutory dividend, while others had earned less, as attributable to any fault on the part of one, or special ability on the part of others. All of them had done their best; and there was nothing in the result of their work which could be criticized adversely. He would, therefore, with great satisfaction propose that the best thanks of the proprietors be given to the Secretary, to the Engineers, and to the staff generally, for their services during the past half year.

Mr. L. R. ABBEY-WILLIAMS seconded the motion, which was at once heartily carried.

The SECRETARY, in responding on behalf of all included in the vote, thanked the Chairman for what he had said. It had been a trying time for all officials of gas companies. Their Engineers had had to contend with high costs of coal and all materials, increased wages, and severe restrictions with regard to lighting. Also the reduction of their staffs through enlistment had added considerably to the work in every department. At times, there must have been at some of their works additional cause for anxiety by reason of the situation of the works. In a lesser degree the pressure of work had been felt in the London office; and he was very glad to have the opportunity of acknowledging the willing help which he had received from all officials there. At times such as the present it was gratifying to receive this vote of thanks, and he was sure it would be specially welcomed by all concerned.

Quality of Sheffield Gas.—The representatives of the Sheffield City Council upon the Board of Directors of the Sheffield United Gas Light Company report that the quality of gas supplied during last year was above the required standard, that considerable extensions have been made, and that the whole of the plant and service mains have been well and efficiently maintained. As compared with 1913, the gas sold during 1914 showed an increase of 2 per cent. The industrial and clerical staff of the Company has been depleted by the war, no less than 343 men having joined the forces.

TRAGIC DEATH OF THE COWES GAS MANAGER.

Accelerated by Gas Poisoning.

Mr. E. H. Millard, the Manager of the Cowes Gas-Works, passed away with tragic suddenness on Monday last week. He went to work that morning, apparently in good health, and had been engaged superintending the installation of a new governor in the retort-house, when he complained of a pain in his chest. He went to his house, where he quickly sank and passed away before the arrival of a doctor.

An inquest was held on Wednesday, by the Isle of Wight Deputy-Coroner (Mr. F. A. Joyce).

Mr. Edward Smith, an engineer in the employ of Messrs. Waller and Son, of Stroud, said he had been putting a new governor in the retort-house. The deceased, who assisted him in every possible way, enjoyed pretty good health, and had not complained about anything. Witness was not at the gas-works when deceased was taken ill, as he was bad himself, suffering from the effects of gas poisoning, the same as Mr. Millard. He was with the deceased at the works on Saturday, when they were both taken ill. On Sunday they were both ill for two hours. They were bound to have it bad, as they had to cut a pipe and put some connections in, and had gas from a 6-inch pipe down on them all the time. As far as he knew, they were both in good health up to Saturday. The gas from the pipe came straight from the retort, and was very foul.

Mr. T. W. Hudson, a clerk employed at the gas-works, said he was at the works with the deceased on Monday. Mr. Millard was walking from the retort-house to the valve-room, when witness approached him, and said, "What is the matter?" Deceased was looking ill, and was in a bath of perspiration. He placed his hands on his chest and complained of pain. Witness asked him what was the matter, and he replied indigestion. He said he had been up over the retorts, which accounted for his perspiration. He had been worrying about the delay in this work. Deceased did not suggest that his illness was due to gas poisoning or an escape of gas.

Mrs. Millard said her husband had been in splendid health during the last two years, and made no complaint whatever. When he returned home, at about 10 o'clock on Monday morning, he said, "What a dreadful pain I have. I have indigestion." He went straight upstairs and was sick, and afterwards went to bed. He put his hand across his chest and said, "It's that foul gas." He had often complained about the gas. She went downstairs, and on returning to the bed-room found him looking very strange. He died shortly afterwards. He complained of the gas twice, either on Saturday or Sunday; but she did not take any notice of it, as she heard him do it frequently when there had been alterations. Deceased had not been attended for heart trouble.

Dr. T. A. Mayo said when he arrived at the house, about 11 a.m., he found deceased dead in bed. He was unable to state the cause of death, and had made a post-mortem examination. He found some slight calcareous changes in the arteries of the heart. From the examination of the body, there was not sufficient evidence to account for death, apart from sudden heart failure. The only point in favour of gas poisoning was the rather bright colouring of the body, which was evidence of carbon monoxide poisoning. The whole thing was very indefinite; but there was so little alteration to the heart from the normal that the evidence strongly suggested that death was accelerated by gas poisoning. One could have a chronic condition of gas poisoning leading to general depression of health. It was his firm opinion that death was accelerated by gas poisoning. It might accelerate or bring on angina pectoris, which otherwise he might not have had for years. He was a man who would probably have an attack of angina at some time or other.

The Coroner said the evidence with regard to gas poisoning was not absolutely convincing; and he thought the Jury should leave it open a little to doubt. He suggested that death was probably accelerated by gas poisoning. There was no evidence of any gas poisoning other than the fact which the widow referred to with regard to deceased vomiting when he returned home. There did not appear to have been much complaint made by the deceased about the gas; and only two persons connected with the works seemed to have suffered from the effects of it.

The Jury returned a verdict of "Death from angina pectoris, accelerated by gas poisoning;" and the foreman expressed deep sympathy with the widow and bereaved family.

Mr. Damant (the Clerk) also expressed the great regret of the District Council, and their appreciation of the deceased's many years' excellent service.

PROPOSED EXTENSIONS AT LANCASTER.

Sir Norval W. Helme, M.P., the Chairman of the Gas Committee of the Lancaster Corporation, brought forward important proposals for the development of the works, at a meeting of the Town Council last Wednesday. The minutes recorded that, upon a report from the Engineer (Mr. Cecil Armitage) as to the extension of works required, in view of the probable large increase in the consumption of gas, the Finance Committee were recommended to apply to the Local Government Board for a Provisional Order authorizing the Committee to obtain borrowing powers for the sum of £80,000, for the extension of the gas-works; such borrowing powers to be exercised as may be necessary, and at such times as the Council and the Government Departments concerned may sanction.

Sir Norval said that five years ago Mr. Armitage pressed upon them the absolute necessity of providing for an increase of the producing plant; and a scheme was brought forward to cost £35,000. Circumstances were not, however, favourable to the expenditure of so large a sum, and an extension of producing power was obtained by the introduction of a larger size of retorts. All the developments at the works had been secured out of profits, except for £6700; and the price of gas had been reduced from 4s. 6d. per 1000 cubic feet to 1s. 10d.. or 1s. for large quantities for motive power. They had contributed £72,500 towards the development of the works, and £59,243 in relief of rates. The whole of their capital powers of £140,215 had been expended, except £1366. Important undertakings were coming to Lancaster; and they proposed to put up a new chimney and increase the carbonizing capacity, at a cost of £10,000. With winter coming on, they could not pull out their retorts, but they could quickly extend the production by erecting carburetted water-gas plant, which they proposed to do at a cost of £7000. He put the matter before the authorities in London, who recognized the urgency of the work; and though it was found impossible to proceed without a Provisional Order, assurance was given that, upon the deposit of the plans, the work would be able to proceed in anticipation of parliamentary sanction. In taking powers for the larger sum, the cost of a second application would be avoided. They were not asking for permission to spend £80,000, or to borrow anything more than the capital required for the immediate extension which was forced upon them. With regard to the £10,000 needed, he pointed out that, under the new arrangement of debt, it was required that £10,000 which they had as a reserve should be transferred to a working balance. If they had had this £10,000, they would not have required to borrow for the renewal and extension of the retorts.

After discussion, the proposal was unanimously carried.

On the recommendation of the Finance Committee, a further resolution was passed authorizing an application for permission to borrow £27,000 for gas-works purposes—viz., £17,000 for extension of works, and £10,000 to replace the reserve fund.

BIRKENHEAD AND ITS CORPORATION PROPERTY.

Position of the Council's Undertakings.

Mr. Thomas Sumner, the Birkenhead Borough Treasurer, has furnished the Town Council with an abstract of the accounts up to the end of the last financial year. It shows an expenditure amounting to £233,654; income, £222,709; expenditure in excess of income, £10,944. Five Committees between them spent £1154 beyond the estimate; and the Gas Committee's income was £10,499 less than estimated. The Local Government Board inquiry into the borough extension cost £4384; but the Board state that they have no power to sanction a loan in respect of expenditure of this nature until the total amount of the costs has first been sanctioned as reasonable. The capital outlay for all purposes amounted to £3,7c0,269; and the total debt was £2,485,149—an increase of £70,958. The amount provided for the repayment of loans now stands at £1,340,688; the increase being £80,906.

The capital outlay on the gas undertaking was £579,164; and the total debt, £376,183. The gross working profit was £25,365, against £36,494, a decrease of £11,129.

The water-works accounts showed an increased income of £10,805, which was attributable to the higher charges for water, and the increased consumption for trade purposes and shipping. The new works capital account showed an expenditure during the year of £83,265, increasing the total outlay on the new water scheme to £402,600.

The total income of the electricity undertaking was £42,151—an increase of £1621; and as regarded expenditure there had been a net reduction of £893. The outstanding debt on the undertaking was £137,567.

The total amount derived from the general district and interest rate was £125,755; and the total amount of the poor-rate was £135,395. In eight years the rateable value of the borough for poor-rate purposes has increased by £54,419.

LIGHTING AND HEATING OF COTTON-MILLS.

Professor Benjamin Moore, F.R.S., delivered a lecture at Oldham last month, under the auspices of the Oldham Workers' Educational Association, in the course of which he dealt with the question of lighting in cotton-mills, and suggested several important improvements from a health point of view.

Professor Moore said a great deal of inside work in cotton-mills produced fatigue which was due in a measure to imperfect lighting and bad air. This was at the root of much of the unrest in the country. Workers became peevish and irritable over quite trivial things. The State had done a great deal to improve the workers' conditions, by the regulation of hours and Factory Acts generally; but the question was whether present conditions could be improved. Light was one of the most important influences for the prevention of disease. This was a reason why open air employment was more healthy than inside work. Few people who constructed mills and factories knew how to manipulate artificial light in the buildings. Most people, in reading a book, thought their eyes ought to be illuminated; and in factories artificial light fell on the workers, and dazzled them, instead of falling upon the work they were engaged upon. The better the eyes were protected or darkened, and the better the work was illuminated, the more work would be done.

After a reference to the importance of ventilation in factories, Professor Moore said he had noticed in many mills that the heating apparatus was installed on a level with the heads of the workers, so that in winter time the floor was excessively cold, and the operatives were scarcely able to work at all. The heating apparatus should be as nearly as possible at the foot level.

Alleged Smoke Nuisance.—The Southend Corporation have received a letter from the Local Government Board enclosing a copy of a communication sent to them in regard to a nuisance alleged to arise at the Gas Company's works from the emission of black smoke from the shafts, retort-houses, and locomotive engines. The letter has been considered by the Health Committee, and instructions have been given to the Town Clerk in reference to it.

INCOME-TAX DEDUCTIONS ON DIVIDENDS.

The Board of Inland Revenue, on the 23rd ult., issued a memorandum as to the deduction of income-tax for the year 1915-16 from payments made after to-day (Oct. 5). It is as follows:

By virtue of a resolution of the House of Commons passed in Committee of Ways and Means on the 21st inst., and having statutory effect under the provisions of the Provisional Collection of Taxes Act, 1913, such deductions of income-tax are to be made in the case of dividends, interest, or other annual sums due or payable after the 5th of October, 1915, as will make the total amount deducted in respect of income-tax for the year equal to that which would have been deducted if income tax for the year had been at the rate of 3s.

The cases in which deductions have to be made in pursuance of this resolution fall into two main classes.

CLASS I.—Payments which are not made out of profits or gains brought into charge to income-tax.

This class comprises:

(*a*) Dividends and interest from the public funds payable between the 6th of October, 1915, and the 5th of April, 1916, both dates inclusive.

(*b*) Dividends and interest of foreign or colonial government securities, or of foreign or colonial companies, entrusted to an agent in this country for payment here between the above-mentioned dates; also the like dividends or interest which, although not entrusted to an agent in this country for payment, are realized in the United Kingdom between those dates through bankers, coupon dealers, or other persons.

(*c*) Interest and annuities paid between those dates by municipal corporations or other local authorities to creditors on rates, and not paid, or not wholly paid, out of profits and gains brought into charge to income-tax.

(*d*) Other interest and annuities paid between those dates, and not paid, or not wholly paid, out of profits and gains brought into charge to income-tax.

In cases falling within Class I.:

(i.) Where any annual payment is made in one sum, tax will be deductible at the rate of 3s. in the pound.

(ii.) Where the dividend, interest, or anunity is paid in two half-yearly sums of equal amount, and one such sum has been paid prior to the 6th of October, 1915, under deduction at the rate of 2s. 6d. in the pound, tax will be deductible from the subsequent half-yearly payment at the rate of 3s. 6d. in the pound.

(iii.) Where the dividend, interest, or annuity is paid in four quarterly sums of equal amount, and two such sums have been paid prior to the 6th of October, 1915, under deduction at the rate of 2s. 6d. in the pound, tax will be deductible from each of the two subsequent quarterly payments at the rate of 3s. 6d. in the pound.

(iv.) Where the dividend, interest, or annuity is paid at other intervals than half yearly or quarterly, or by payments unequal in amount, and one or more payments have been made after the 5th of April, 1915, and before the 6th of October, 1915, tax will be deductible from any further payment or payments at the rate of 3s. in the pound, and, in addition, such a sum will be deductible as is required to make up the difference between the total amount of the tax actually deducted from the previous payment or payments and the total amount that would have been deductible from such previous payment or payments if the rate of tax had been 3s. in the pound throughout the year commencing on the 6th of April, 1915. If at the time of the first payment subsequent to the 5th of October, 1915, the total amount of the dividend, interest, or annuity payable in the year ending the 5th of April, 1916, can be ascertained, the additional deduction in respect of the previous payment or payments should be apportioned equally between all the subsequent payments to be made during that year. Otherwise, the whole additional deduction should be made from the next payment subsequent to the 5th of October, 1915.

CLASS II.—Payments made after the 5th of October, 1915, out of profits or gains brought into charge to income-tax.

This class comprises:

(*a*) Ground rents, &c., secured on property charged with income-tax.

(*b*) Interest or annuities wholly payable out of property, profits, or gains charged with income-tax.

(*c*) Dividends paid out of the profits or gains of public companies in the United Kingdom.

Tax is deductible from payments falling within this class at the rate or rates in force during the period through which the same were accruing due.

The adjustment of deductions from such payments is primarily a matter to be settled between the payer and the recipient, and does not immediately concern the revenue.

Under the provisions of the resolution, the general principle upon which the payer is entitled to deduct tax from annual sums of this class due or payable after the 5th of October, 1915, is that the total amount deducted on account of payments accruing in the year commencing the 6th of April, 1915, shall be at the rate of 3s. in the pound.

The following observations may be of assistance to those concerned in making or adjusting deductions from payments of this class.

(i.) Tax may be deducted at the rate of 3s. in the pound in respect of so much of any payment made after the 5th of October, 1915, as has accrued between the 6th of April, 1915, and the 5th of April, 1916, inclusive.

(ii.) Where before the 6th of October, 1915, tax has been deducted from a payment or payments accruing wholly or in part after the 5th of April, 1915, a further deduction, in addition to that mentioned in the preceding paragraph, may be made from the subsequent payment or payments accruing before the 6th of April, 1916, of such a sum as is required to make up the difference between the total amount of the tax actually deducted from so much of the previous payment or payments as accrued after the 5th of April, 1915, and the total amount of the tax that would have been deducted if the rate of tax had been 3s. in the pound throughout the year commencing the 6th of April, 1915. This further deduction should be made from the next payment made after the 5th of October, 1915, except in the case of two equal quarterly payments, when it should be divided.

BUILDING ECONOMIES AND GAS-FIRES.

The number of the "Builder" for the 24th ult. points out that "it has now become a recognized fact that modern gas-fires have immense possibilities as heating agents;" and our contemporary proceeds to give some notes on types of modern gas-fires and their "possibilities as regards present and future economy in building."

The article—after dealing with the question under the sub-headings of: Radiant heat, the hygienic aspect of modern gas heating, the old-age domestic problem, modern improvements, the architect and builder and the portable fire, the wastefulness of using two appliances for one purpose, the sentimental desire for the appearance of a coal-fire, coal-grates that rapidly fall into disuse, the architects' and builders' difficulty in the past, a wide choice of gas-grates now available—proceeds to point out that there are, of course, several economies possible in buildings where initial preparation is made for gas-fires. First, there is no need to set coal-grates in position, but tiled bricks or slabs may be fixed instead, leaving suitable openings against which the gas-grates or gas-interiors may be stood. Second, the size of the chimney flue could be materially reduced, as a gas-fire does not need—indeed, it works better without—such a large flue area as a coal-fire, because the quantity of products of combustion the chimney flue is required to deal with or remove is so very much less, and there is no soot deposited to reduce or partially obstruct the flue area. The largest gas-fire made does not need a chimney flue with an area of more than 36 square inches. The most suitable chimney flue for the flue outlets at present constructed to gas-fires is one of an oblong shape, say, 12-inch by 3-inch, or thereabouts. Third, owing to the smaller flue area required, if suitable flues were constructed when buildings are erected, there would be an increase of floor-space in every room, because the present depth and width of chimney breasts would be reduced. The heat would also thereby be more evenly distributed about the room, as the radiance from a coal or gas fire cannot penetrate into the fairly deep alcoves now made on either side of the chimney breast, owing to its projection into the room.

The concluding section of the article deals with "some recent interesting installations," concerning which our contemporary says: We know of one eminent architect who at his own residence, which was recently built, adopted the plan of having gas-fires fitted in marbled or tiled openings in every room except one, which has a coal-grate for sentimental and constant use. It is worth mentioning also that the members' bedrooms at St. Stephens' Club, which has recently been rebuilt, are all fitted with gas-grates set back to tiled openings; no coal-grates having been fixed.

The details of a unique gas-fire installation in an operating theatre that was recently built in an important private hospital in London should be of interest to our readers. In this case only a flat wall could be provided, and no chimney breast—any projections in such a room being, of course, as far as possible "taboo."

When consideration was being given to the problem of heating this operating theatre, it was decided that if gas could be applied in a suitable form it would fulfil all the requirements—viz., to provide a considerable amount of heat at a moment's notice and at an economical rate. No dust or dirt was to be emitted, and no attention or clearing-up was to be required. It was necessary that the heat, when it was no longer required, should be capable of being dispensed with as rapidly as it was generated. Of course, in this case a coal-fire or an ordinary portable gas-fire to stand in front of a grate would not have conformed to all the rules, and would not have been permissible; but the difficulty was got over by providing a shallow flue in the wall, and actually building into the wall a gas-grate consisting of little more than a copper band and a canopy, which are fixed back into the marbled wall, containing the burner, firebrick, and necessary fireclay uprights or radiants. The fire was a wide duplex one, and the knobs shown at the bottom take the place of the usual taps to control it—making it possible to use all the fire or only the centre, leaving the outside radiants out of use.

THE COAL BYE-PRODUCTS INDUSTRY.

A General Meeting of the South Wales Institute of Engineers was held at Swansea last Tuesday—under the presidency of Principal GRIFFITHS, F.R.S.—when an interesting discussion took place on three papers, by Messrs. Butterfield, Watts, and Greaves, dealing with the utilization of bye-products of coal, which were read at the Cardiff Trade Extension Conference last April, as reported in the "JOURNAL" at the time—see Vol. CXXX., pp. 205 to 212.

Mr. H. T. WALES, ex-President, referred to the dependence of this country upon Germany for many valuable bye-products, while all the time we had been producing vast supplies of the raw material, coal, which only required to be properly treated to give us all we needed of these important substances. Individual collieries—owing to difficult physical conditions underground—could only produce relatively small outputs of coal of a suitable kind for yielding bye-products; and this appeared to be a clear case where co-operation would be of great benefit. If a group of collieries joined together to erect bye-product recovery plant on a scale to ensure profitable working, there would be a considerable increase in the selling value of the output of each of the collieries so combined.

Mr. C. A. SEYLER said the chief sinners in this matter were works proprietors and capitalists, in their lack of appreciation of scientific work. They had not enough imagination to spend money—as the Continental capitalist always did—where they could not see an immediate

profit; and the man who could not imagine a profit did not deserve it. The British scientist was every whit as able and as inventive as the German; but he was not afforded the same opportunities. The result was that England was paying the penalty during this war.

The PRESIDENT agreed generally with Mr. Seyler's observations—adding that all their energies in South Wales seemed to have been devoted to getting coal rather than finding out how best to use it. The greatest advances in chemical discovery, he said, had not been made by Germans but by the English and the French.

Mr. T. G. WATTS, one of the authors of the papers under discussion, said the great obstacle was to get works proprietors to understand the value of the laboratory. There were very few industries in South Wales where any chemist was employed; and this only lately. They started the coke-oven industry in South Wales twenty years after Germany did so, and they were still twenty years behind the Germans in their output. There was more waste of coal going on in South Wales than most people were aware of.

Mr. R. H. GREAVES, another of the authors, said it could not be denied that, in the use of coke-oven gas for lighting purposes and for the production of electrical energy, Germany had enormously outpaced England. In South Wales at present nothing had been done in this direction except at Bargoed, though it need not be feared that the low volatile coals used for coking in South Wales would be unfit for the purpose. Belgian coals with 18 or 19 per cent. of volatile matter were yielding 4000 cubic feet of gas per ton for town lighting, with a candle power of 560 B.Th.U. per cubic foot. The public would, of course, have to be guarded against any attempt to force-up the price of coke-oven gas in the event of the shutting-down of local gas-works. Coke-oven owners, on the other hand, would have to consider the question of their responsibility to the public for a permanent supply, involving the maintenance of the working of the ovens regardless of the fluctuations of the coke market. There was no part of the United Kingdom more fitted to test these things than South Wales.

The PRESIDENT complimented the authors upon the most useful information they had embodied in their papers, and the discussion was closed.

NOTES FROM SCOTLAND.

From Our Own Correspondents.

Saturday.

At last Monday's meeting of the Edinburgh and Leith Gas Commissioners, the minutes presented by the Works Committee included an estimate of the revenue and expenditure of the Trust for 1915-16, by Mr. A. Canning Williams, the Treasurer and Collector. It was assumed that the sale of gas to private consumers and in bulk would be the same as for the year 1914-15; and that for public and stair lighting there would be a decrease in consumption of 50,455,950 cubic feet. The expenditure items amounted to a total of £380,955. Residuals were expected to bring in £78,705 (as compared with £68,702 in 1914-15); and rental of gas-fires and sundry items, £12,860. This left £289,390 to be raised from the sale of gas. By increasing the price 8d. per 1000 cubic feet to ordinary consumers and for gas consumed beyond the municipal boundaries, and 6½d. per 1000 cubic feet to prepayment consumers, it was anticipated a net revenue from gas of about £291,520 would result, or £2130 more than the actual sum required to balance the estimated expenditure. This surplus, it was suggested, should be appropriated as a first instalment towards the £9320 which is due to the Special Reserve Fund.

The price of gas to prepayment consumers was proposed at 3s. 3d. per 1000 cubic feet—7d. beyond that charged to ordinary consumers. When it was decided to reduce the extra charge to these consumers from 1s. 1½d. to 7d. per 1000 cubic feet, the prepayment mechanism of the meters was not adjusted to give the increased quantity of gas for 1d.; but 6½d. per 1000 feet was returned to the consumers as a rebate. It was now suggested that this rebate should be discontinued. This concession of 1½d. per 1000 feet would amount to about £326 up to May 15 next; but the cost of altering the meters would be saved. The respective prices to ordinary and prepayment consumers would thus be 3s. 4d. and 3s. 9½d. per 1000 cubic feet. The Commissioners agreed to the additional charge without discussion.

In July last, Mr. Williams pointed out, it was resolved to act along with the Convention of Royal Burghs in applying to Government to suspend all sinking funds during the war. Action was duly taken. In his reply to the recommendations of the Annual Committee of the Convention, the Secretary for Scotland—while admitting that gas undertakings were placed in an exceptionally unfavourable position owing to the war, and that there might be some ground for their expecting a certain measure of relief after peace had been declared—said that he could hold out no hope that the proposal to suspend the sinking funds could be entertained.

The Aberdeen Gas-Works assessment case has now been for the time settled. It may be remembered that the Parish Council appealed against the following entries being made by the Assessor in the valuation roll for the gas-works:—

Gas-works buildings	£2,759
Apparatus	5,061
Machinery	637
Railway	107
Main and service pipes	3,002
Total	£11,566

The Parish Council craved that the valuation of the subjects should be entered in one sum, and increased to the amount of £20,226. The Lord Provost gave the decision of the Court as follows: The Magistrates having heard the arguments of the parties, and considered the case, are of opinion that the decision in the Arbroath case confirms the practice of arriving at the rent or annual value on the basis of the revenue of the preceding year, and accordingly sustain the entries made by the Assessor, and dismiss the complaint. The Agent for the Parish Council expressed dissatisfaction with the decision of the Magistrates, and asked for a case to be stated. This was agreed to.

On the 23rd ult., the Lanarkshire County Valuation Appeal Court held a special meeting to consider appeals by the Motherwell Town Council against the valuation of their Motherwell and Carfin Gas-Works. In the case of the Motherwell works, the valuation was reduced from £7693 to £5600; and in the case of the Carfin works from £1036 to £600. Mr. A. Mackay, the Gas Manager, conducted his own appeals; and, as the results show, he made out a splendid case for the reduction of the valuation.

A long discussion regarding the undelivered balances of coal contracts took place at last Tuesday's meeting of the Dundee Gas Committee. In answer to a question, the Convener stated that their stocks at present amounted to 15,000 or 16,000 tons—a very satisfactory stock. The Town Clerk reported an interview he had had with the coal merchants who had not completed their contracts. He said the merchants explained that their reason for not delivering the whole quantity contracted for was that the Gas Department did not take any portion of the coals contracted for in June until September. Between September and April, consequent on the war, their deliveries from the collieries were restricted. Mr. Yuill, the Gas Manager, had prepared a lengthy statement, in the course of which he said that the invariable practice in regard to balances had been to carry them forward for delivery during the ensuing months. This was the first instance of contractors refusing to deliver balances after the end of April. He had prepared a statement showing the deliveries of coal from May 1, 1913, with the balances standing at that date; and it would be seen that all had been delivered during the subsequent period until completion. There were also a number of balances of Broughty Ferry contracts—varying from 20 to 300 tons; and these were all delivered during the subsequent months. The total amount delivered was 2800 tons.

Yesterday week a special meeting of the Perth Town Council was held to receive the accounts of the Gas Department and to fix the rates for the current year. Ex-Bailie Wright, the Gas Convener, in the course of his statement, referred to the causes responsible for the decrease in the number of gas accounts, which was mainly brought about by the shortage of coal and the decreased value of bye-products. He moved that the rate be fixed at 3s. 6d. per 1000 cubic feet. Ex-Bailie MacPherson, who seconded, said he thought the extension of the gas scheme to Bridge of Earn, Almondbank, and Methven was a sound commercial transaction. The rate suggested was unanimously adopted.

At the last meeting of the Sanquhar Town Council, some discussion took place relative to the cost of running the gas-works and the price to be charged for gas. The Town Clerk explained that there was outstanding the sum of £544 of capital expenditure, and also a sum of £84 to the contractor for laying the new main. Authority for a loan of £700 was granted. The Town Clerk stated that the revenue from the gas-works for the year ended May 15 last was £1015. The expenses of running the works were £780; reduction of loan, £90; interest on loans, £241. This gave a loss of £7 on the year's working; and with the increase in the cost of labour, coals, and the extra interest on the proposed new loan, it would be necessary to increase the price of gas. It was stated that if an increase of 5d. were made, it would yield about £70, which might suffice. After discussion, it was decided to increase the price of gas accordingly—ordinary meters from 5s. to 5s. 5d. and prepayment meters 1d. for 14, instead of 15 cubic feet. Gas through prepayment meters will cost 5s. 10½d. per 1000 cubic feet.

A Year's Gas Consumption in Leeds.

The annual report of the Leeds Corporation Gas Committee (issued last week) states that the gas made during the year ended June 30 was 2,970,185,227 cubic feet—an increase of 5·2 per cent. upon the previous year. The quantity of coal and cannel carbonized amounted to 260,482 tons, or an increase of 5·5 per cent. upon the previous year. The quantity of gas sold, including that used on the works, gasholder stations, &c., was 2,728,166,093 cubic feet, or an increase of 5·7 per cent. The revenue account shows a deficiency during the year of £32,982, against an estimated deficiency of £9170; the difference being due to the decrease in the price of residuals and the reduced consumption caused by the war. To this figure must be added the deficiency of £16,326 brought forward from the previous year.

Street Lighting at Bagshot.—A special meeting has been held by the Bagshot Urban District Council to consider the question of street lighting, consequent upon a communication from the Gas Company asking for an increase in their terms of contract. The Surveyor (Mr. W. D. Bell) reported that at the previous meeting the Council recommended all lamps should be fitted with incandescent burners, which he had ascertained would mean an increased cost of 3s. 6d. or 4s. per lamp. The Chairman (Mr. S. W. Evans) said he thought it unnecessary to have the incandescent burners during the war. After discussion, the Clerk was instructed to inform the Company that the Council could not agree to pay the extra 3s. per lamp demanded, but were prepared to renew the contract on the old terms. If the Company could not undertake this, the Council asked for an estimate for lighting a portion only of the lamps.

Sidmouth Gas-Works' Extensions.—At a meeting on Monday of last week of the Sidmouth Urban District Council, it was reported that a notification has been received from the Local Government Board that permission will only be given at present to borrow the sum of £1073, which has been expended on an extension of the gas-works; £569 of the £1130 expended on meters and cookers; £329 of the £500 expended on mains and services; and £136 of the £391 expended on pipes and fittings. The Gas Committee have written to the Board urging that the borrowing of the whole amount should be sanctioned, inasmuch as the expenditure proposed is necessary in order to provide a number of ratepayers with cheaper means of cooking than are provided by the ordinary coal-fire. The Chairman (Mr. J. G. H. Halse) thought the Council ought to do everything they could to bring pressure on the Local Government Board to sanction this work. It was not only for the immediate benefit of the whole community, but it would help to make the gas-works self-supporting.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *Oct.* 4.

There are no new features in the tar products market. It is reported that during last week 26s. net at makers' works was again realized for pitch for export. Solvent naphtha is in good demand at from 2s. to 2s. 1d. net and naked at makers' works; while creosote is steady at 4¼d. net in bulk. Creosote salts and naphthalene are almost unobtainable, and the values are very high.

Sulphate of ammonia is in increasing demand. Buyers are no doubt encouraged by the expectation of greater freedom in obtaining export licences than has recently been the case. Makers quote £14 7s. 6d. net and naked at producers' works for the 25 per cent. quality.

Tar Products in the Provinces.

Oct. 4.

There is practically no alteration in the markets for tar products. It is very difficult to do business in pitch, in spite of the willingness of manufacturers to accept reasonable prices. Creosote is still quiet, and difficult to sell. Solvent and heavy naphthas are in very good demand.

The average values of gas-works products during the past week were: Gas-works coal tar, 20s. 3d. to 24s. 3d. Pitch, East Coast, 21s. to 21s. 6d. per ton; Norfolk, Suffolk, and Humber ports, 19s. to 20s.; West Coast, 20s. to 21s. Manchester; 21s. to 21s. 6d. Liverpool; 21s. to 22s. Clyde. Benzol, 90 per cent., North, 10½d. to 11d.; 50-90 per cent., naked, North, 1s. 3d. to 1s. 4d. Toluol, naked, North, 2s. 2d. to 2s. 4d. Coal tar crude naphtha, in bulk, North, 6½d. to 7d. Solvent naphtha, naked, North, 1s. 11d. to 2s. Heavy naphtha, naked, North, 1s. 2d. to 1s. 3d. Creosote, in bulk, North, 2⅞d. to 3d. Heavy oils, in bulk, 3⅛d. to 4d. Carbolic acid, casks included, 60 per cent., East and West Coasts, 3s. 5d. to 3s. 6d. Naphthalene, £16 to £25; salts, 75s. to 80s., bags included. Anthracene, "A" quality, 2d. to 2½d. per unit; "B" quality, nominally ¾d.

Sulphate of Ammonia in the Provinces.

LIVERPOOL, *Oct.* 2.

At the commencement of the week the tone continued dull, but by the middle of the week there was renewed activity in the market, and higher figures have been paid at all ports. New foreign business has not been large, but all available supplies have been keenly competed for by middlemen. The nearest prompt values are now £14 11s. 3d. per ton f.o.b. Hull, £14 13s. 9d. f.o.b. Liverpool, and £14 16s. 3d. f.o.b. Leith. The improvement has also been felt in the forward position, and producers report that they have realized £15 per ton f.o.b. Liverpool for October-March delivery in equal monthly quantities.

Nitrate of Soda.

The market for this material has advanced further, and spot quotations are now 13s. 6d. per cwt. for ordinary quality, and 14s. 6d. for refined.

Sulphate of Ammonia.

From another source it is stated that this market has been quiet throughout the past week, and there is practically no alteration in prices. Outside London, makes are quoted at £13 17s. 6d.; Hull, £14 7s. 6d.; Liverpool, £14 7s. 6d. to £14 10s.; Leith, £14 12s. 6d.; Middlesbrough, £14 7s. 6d. to £14 10s.

COAL TRADE REPORT.

Northern Coal Trade.

In the northern coal trade, the demand is steady, and prices on the whole are firm. But steamers are rather scarce, and this has its effect on the shipments. In the steam coal trade, best Northumbrians are from 18s. to 18s. 6d. per ton f.o.b.; second-class steams are about 16s. per ton; and steam smalls are from 11s. to 14s. per ton f.o.b., according to the class. In the last week or two, smalls appear to have been more abundant, and thus the values on the whole are a little easier. Work is rather more active at the collieries, and there is a steady output. The gas coal trade shows fuller activity; and the deliveries appear to be growing, both on the long home contracts and for export to some of the southern countries. Best Durham gas coals are from 19s. per ton f.o.b.; second-class qualities are about 16s. 6d. to 17s. per ton; and for "Wear Specials," the current quotation is from 20s. to 20s. 6d. per ton f.o.b. There has been some attempt at negotiation for forward supplies of coal for the Paris Gas Company, but high prices and freight have so far prevented any settlement. The freights in the open market for gas coal are based on about 9s. Tyne to London; but the rates for the steamers that were interned are a little lower. In the coke trade, production is slowly increasing, but is well taken up. For good gas coke, the price is steady at 28s. to 30s. per ton f.o.b. in the Tyne.

Price of Gas Increased at Rowley.—A notice has been issued by the Rowley and Blackheath Gas Company, announcing an increase in the price of gas of 3d. per 1000 cubic feet. The notice states that, when the Directors advanced the price at the end of the March quarter, they hoped this would be sufficient to meet the increased cost of coal and other materials; but the advance which has taken place in the price of all materials necessary for the manufacture and distribution of gas has been more than was expected.

Careful attention will be given to YOUR enquiries.

R. & J. DEMPSTER, Ltd., MANCHESTER.

London Office: 165, GRESHAM HOUSE, Old Broad St., E.C.

Machinery Depreciation and Income-Tax.

In the House of Commons on Tuesday last week, Mr. Nield asked the Chancellor of the Exchequer whether the allowance for depreciation on machinery under income-tax assessment will be increased, in view of the addition to the tax on the manufacturing community, among whom there is a consensus of opinion that the present 5 per cent. allowance is inadequate, in view of the rapidity with which modern machinery calls for replacement. In his reply, Mr. M'Kenna stated that the rates of allowance for depreciation upon machinery, even in trades where a standard rate has been fixed by agreement with representative trade associations, are not rigidly fixed, as suggested by the question. The Commissioners of Taxes are empowered to make such deduction as they may think just and reasonable according to the circumstances of each case.

An Interrupted Gas Supply.—A Reuter telegram from Amsterdam on Monday of last week stated that the "Telegraaf" learned from the frontier that on Sunday afternoon bombs were once more thrown on Bruges. At Sluis, which gets its gas supply from Bruges, a sudden fall was noticed in the gasholder at about two o'clock. The gas supply had ceased, and has not been restored up to now. It is surmised, though, of course, without certainty, that the gasholder at the Bruges works has been damaged.

Cirencester Gas Company, Limited.—The ordinary general meeting of this Company was held last Wednesday, when the accounts submitted showed that the profit for the year to June 30 was £3439; the sale of gas being more than 3 million cubic feet above that of the year ending June, 1914. The price of gas has recently been raised 5d. per 1000 cubic feet. The dividends agreed to made, with the interim amounts already paid, 11, 5½, and £7 14s. per cent. per annum on the several classes of shares. A further £200 was added to the contingency fund, making it £2232.

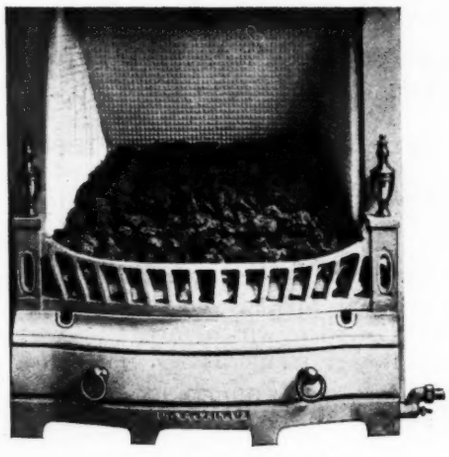
Mr. Webb, of Stourbridge, Annoyed.—At the Stourbridge Town Council meeting yesterday week, the Gas Committee reported that they had interviewed Mr. Councillor Keeble as to the grounds for his statement at the last meeting of the Town Council relative to alleged pressure put upon employees of the department with a view to their enlistment in His Majesty's forces. They recommended that the Town Council "express to the Manager of the Department their regret at the annoyance caused him by the accusations made, which on investigation proved to be without any foundation of fact." Mr. Keeble said, when he made his previous statement, he did so in good faith. He wished to express his regret to the Manager for any pain and annoyance that the word "coerce" had caused him; otherwise he stood by what he said previously. Several members of the Council criticized Mr. Keeble's conduct; and the Council adopted the recommendation with the addition of the words, "and regrets exceedingly that Councillor Keeble has not made a satisfactory apology to the Gas Manager for his charges."

Gas and the War.

In a lecture to the Doncaster Tradesmen's Association, on the "Production and Uses of Gas" [which covered the complete ground of the origin and development of the gas industry, the method of manufacture, the improvements effected in gas lighting, the remarkable development of gas for heating purposes, and its manifold applications to commercial and industrial work], Mr. Robert Watson, the Gas Engineer, threw some sidelights on the important part the gas industry is now playing in the production of munitions of war. Dealing with the bye-products, he mentioned that benzene and toluene were the raw materials for the manufacture of explosives. The oils derived from tar contained picric acid, which was the basis of lyddite, melinite, and the Japanese explosive shemose powder. A product of recent times derived from gas was toluene, which was the base of "T.N.T.," the chief high explosive used in the present war. Practically all the gas producers in the country were engaged in supplying this important bye-product to the Government; and while he could not say much publicly as to the methods employed, he could state that the Doncaster Gas Department had earned an appreciative letter from the Ministry of Munitions as to the results they had obtained. Touching on the important part played by gas bye-products in the dye industry, Mr. Watson observed that this industry was in the hands of the Germans; but we were now endeavouring to get it back in this country, and he believed we should succeed. Since the beginning of the war, gas had been found of increasing value in many phases of the manufacture of armaments; and enormous quantities were being used in munition areas. Gas-furnaces, large and small, were being employed in the heat treatment of shells. One furnace recently supplied to an armament firm held at one charge eleven of the largest naval armour-piercing shells, each shell weighing somewhere about a ton. In oven-furnaces of various kinds, brass cartridges and shell cases, revolver parts, army utensils, brass buttons, &c., were annealed. Gas blow-pipes were used for such purposes as welding handles on to bayonets, brazing, and repairs. A hearty vote of thanks was accorded the lecturer.

Increase of Price at Devonport.—The Plymouth Corporation Gas Committee have decided to increase the price of gas, from the meter readings for the Michaelmas quarter, by 3d. per 1000 cubic feet. This will make the cost to ordinary consumers 2s. 7d. per 1000 feet; the quantity supplied to slot consumers being reduced from 27 to 25 feet for 1d. The increase only applies to the Devonport area of the extended borough of Plymouth. In the area supplied by the Plymouth and Stonehouse Gas Company, the price is 2s. per 1000 cubic feet; and the Company recently announced that it will probably remain at this figure throughout the winter. For public lighting the discount of 5 per cent. is to be discontinued; and for power, 2s. 4d. per 1000 feet is to be charged. Mr. Isaac Carr, the Consulting Engineer to the Corporation, attended the meeting at which the advance was agreed to, and reported upon the working of the undertaking.

THE MAIN GAS FIRES.



The ST. NICHOLAS.

The St. Nicholas—

The Gas Fire without a rival.

The new booklet—"Main Reflections"—contains particulars of several new Gas Fires. Copies free on application.

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WORKS: Gothic Works, EDMONTON, N. Gothic Ironworks, FALKIRK; and Gothic Works, BIRMINGHAM.

SHOW-ROOMS AND BRANCHES: 25, Princes Street, Oxford Circus, W.; 136, Renfield Street, GLASGOW; 56, Broad Street, BIRMINGHAM; 83, Old Market Street, BRISTOL; 18, Severn Street, Deansgate, MANCHESTER; 97, Millfield, BELFAST; 333, Queen Street, MELBOURNE; and 12, Cunningham Lane, Pitt Street, SYDNEY, N.S.W.

London Lighting Restrictions.

Additional stringent restrictions came into force in the London district on Friday last, which have had the effect of further reducing the light available for wayfarers after dark. It is ordered that public lights in streets and squares, on bridges, and in all other public places, must be so extinguished, reduced, shaded, or obscured as to break up all conspicuous groups and rows of lights and to produce as nearly as possible a uniform distribution of street lighting. Sky-signs, illuminated fascias, illuminated lettering, and outside lights of all descriptions used for advertising or for the illumination of shop-fronts, must be extinguished. The intensity of the inside lighting of shops and shop-fronts must be reduced so that no more than a subdued light is cast in any direction outside the premises. All sources of light must be so screened as to cut off all direct light from windows and doors. Bright lights in hotels, flats, dwelling-houses, &c., must be shaded or windows screened, so that no bright light is cast in any direction outside. All large lighted roof areas must be covered over or the lighting intensity reduced to a minimum. The lighting of railway stations, sidings, and goods yards must be reduced to the intensity sufficient for the safe conduct of business. The upper half of the globes of all bright lights must be shaded or painted over. Lights along any water-front must be masked to prevent as far as practicable the reflection of the light upon the water. The aggregation of flares in street markets is prohibited; but properly screened lights of moderate power may be used. In case of a sudden emergency, all instructions given by the Admiralty, as to the further reduction or extinction of lights, must be immediately obeyed. This order applies to the City of London and the whole of the Metropolitan Police District, from 6 p.m. till sunrise.

Brighton (Victoria) Gas Company, Limited.—The half-yearly meeting of this Australian Company was held on Aug. 12. The report and balance-sheet showed that the profit for the half year to June was £4626; and after providing for fixed charges, there remained a balance of £3933, which, with the balance brought forward, made a total of £9354 available for distribution as follows: Dividend of 6 per cent., £1800; renewals account, £2100; balance carried forward, £5454. The sales of gas increased by 11·7 per cent. over those of the corresponding half of 1914. The number of consumers had increased from 3039 to 3384, and gas-stoves from 2196 to 2584.

Leamington Priors Gas Company.—At the annual meeting of the Leamington Priors Gas Company last Tuesday the Chairman (Dr. T. W. Thursfield), in proposing the adoption of the accounts, said the war had affected the whole range of the Company's operations, and precautionary measures were taken without loss of time. The reserve funds, which were invested in Consols, amounting to £8960, had been converted into war loan; and in addition the Company had invested a further £2000 in the new 4½ per cent. war loan. Dividends of £1, 14s., and 9s. 10d. on the "A," "B," and "C" shares respectively were declared. Mr. Thomas Berridge was re-elected a Director.

Bexhill Water and Gas Company.

The half-yearly meeting of shareholders was held last Wednesday in London, Mr. Alex. H. Kersey in the chair. The accounts showed a balance available for dividend of £8013; and the Directors recommended £6 10s. per cent. per annum on the Company's capital of £34,000, authorized by their Acts of 1885 and 1892, and at the rate of £4 11s. per cent. per annum on the Company's capital of £123,710, authorized by their Act of 1896, Order of 1901, and Act of 1904, less income-tax. This, with due provision for income-tax, would absorb £3919, leaving £4094 to be carried forward to the next account. The revenue of the six months had amounted to £13,507, as compared with £12,732 in the corresponding period of 1914—being an increase of 6 per cent. The revenue from water had increased by £445, from gas by £348, giving a total increased revenue of £793. The expenditure had increased on water by £275, and on gas by £257—total, £532; while the general expenditure on water had increased by £85, and on gas by £48. The balance carried forward was greater than this time last year by £649. The increase shown in the Company's earnings by these figures, said the Chairman, told of the steady progress of the organization. But the increase in the expenses had also been very heavy, principally in coal, wages, and general outgoings. Yet these were not proportionately so great as in many similar undertakings. Under all the circumstances it was a matter for congratulation that they were able to pay the same dividend as last year; and it was the hope of the Board that they might have a similar pleasure in a year's time. With regard to the future—none of them could forecast the future of any industrial or commercial undertaking in the present terrible state of the world—it all depended upon the duration and result of hostilities. The Company so far had not been so seriously affected as was feared. Owing to the higher price of coal, &c., it had been decided to raise the price of gas 3d. per 1000 cubic feet as from the Michaelmas readings. The future prosperity of the Company was intimately bound up with the prosperity of Bexhill; and it was well for the future that there was not the smallest sign of depression in or around the town. It appeared to be eminently prosperous, and it had enjoyed an extremely good summer season, while the presence of troops, both in camp and billet, must be a financial benefit to the neighbourhood. In these most anxious times the Directors had given unflagging attention to the business; and the staff had worked with the most loyal and devoted self-sacrifice and energy.

Fire at the York Gas-Works.—A fire last Sunday week, which originated at a tar plant erected close to the York Gas-Works, caused some amount of damage to apparatus used in the manufacture of gas, though fortunately not sufficient to necessitate the cutting off of the supply. A portion of an overhead railway siding was badly affected; and a meter-house and pump-house also suffered. Ample help was promptly forthcoming; and after about two hours' hard work, the efforts to overcome the fire were rewarded.

Wright's Crucible Melting Furnace.

At a Metal Melting Test made before the Newcastle and District Association of Foremen Engineers and Mechanical Draughtsmen, July 19th, 1915, 61 lbs. 7 oz. of COPPER was melted at the rate of 2·11 cubic feet of Gas per lb. of Metal Melted.

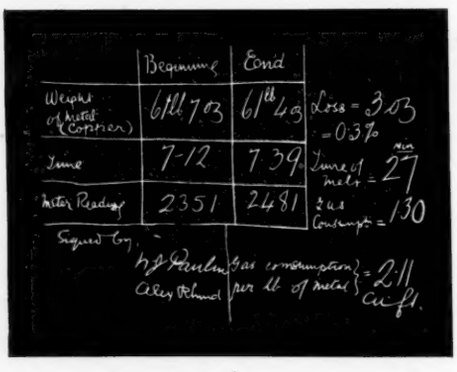

Photo. of Blackboard, recording the Test.

N.B.

The metal melted was COPPER (not BRASS, which melts at a much lower temperature).

The test was no mere private laboratory trial, nor with a special apparatus.

It was a Public Demonstration made with ordinary apparatus.

No special contrivance for Gas-and-Air is required with this or any of our Furnaces.

JOHN WRIGHT & CO.,
Essex Works, BIRMINGHAM.

Municipal Water-Works Association.

At the annual meeting of the Association, which was held in London last Friday, Lieut.-Colonel R. S. Porter, J.P. (the Chairman of the Liverpool Water Committee), was elected President, and delivered an address, in the course of which he remarked that the fact that the terrible disasters which had overwhelmed civilization would have the effect very largely of curtailing domestic legislation—especially in the direction of the national conservation of the water supply of the three kingdoms—ought to strengthen the intention of the Association not only to safeguard mutual interests, but to endeavour to bring some harmony and concord where otherwise there would be dissensions and conflicting interests in the scramble for water sources. Referring to a proposal to enlarge the membership so as to embrace some of the smaller water authorities, he said the hanging-up of legislation would appear to indicate the desirability of the Association enlarging its sphere of influence. The Association should be a forum both for the concentration of effort where general unanimity prevailed, and for the removal or smoothing-down of difficulties where local interests might be thought to clash. One result which would flow from such a policy would be that the waste of ratepayers' money in Private Bill Legislation might be largely avoided. Still another matter for mutual usefulness and the safeguard of the ratepayers' purse was in connection with litigation. Having regard to the extraordinarily complex condition of water legislation, both local and general litigation must arise; but it did seem to be unfair that one unhappy water authority where some particular point had happened to crop up, should be called upon to fight perhaps a very important principle right through to the House of Lords, not only for their own benefit, but for the benefit of scores of other authorities. It ought to be possible so to arrange through the Association, when any legal dispute of a general nature arose, that some effort should be made to spread the expense over all those who were concerned in securing a satisfactory decision.

Irish Gas Prices.—The Navan (co. Meath) Gas Company have intimated an increase in the price of gas of 3d. per 1000 cubic feet. In Lurgan, the Gas Company announce that the price of gas for street-lamps this year will be 4s. 2d. per 1000 feet, *plus* the cost of up-keep, as compared with 3s. 10d. last year. The Council have decided to reduce the number of lamps in use, in order to economize.

Dorking Gas Company.—It was reported by the Directors at the half-yearly meeting of the Company that, after providing for interest on the debenture stock, there was a balance of £1989 available for distribution; and a dividend at the rate of 5 per cent. per annum on the various classes of shares was declared. After payment of this, there will be £739 to carry forward. The Chairman (Mr. H. Young) referred to the difficult period through which they had been passing, and expressed the regret of the Directors at having had to raise the price of gas last June.

Building Wrecked by a Gas Explosion.—A quantity of gas that had accumulated from an escape became ignited and exploded last Tuesday at Nos. 123 and 125, Newington Causeway, S.E., with disastrous results to property. An extensive building of three and five floors, 100 feet long and 30 feet wide, used as workrooms and stores by Messrs. Witsell and Co., was completely wrecked—all the windows being shattered and the contents hurled in every direction and smashed. Fortunately, no one was injured.

Rating of the Truro Gas-Works.—A recommendation by the Assessment Committee, that an expert surveyor should be engaged to value the property of the local Gas Company, has been referred back by the Truro Board of Guardians. The Chairman (Mr. W. C. Blamey) expressed the opinion that this was not the time to assess anything higher; and the matter should be arranged. This was also the view which had previously been put before one of the councillors by the Gas Manager (Mr. S. J. Ingram), who had pointed out that the calling-in of an expert would probably end in going to Quarter Sessions, and that it would be better for the Committee and the Company to agree. The Company were prepared to leave it to an umpire.

Stoppages of Gas Supply in Turkey.—The correspondent of the "Nieuws van den Dag" in the Turkish capital reports that scarcity is gradually beginning to be felt in almost everything; and the prescriptions and regulations interfering with the ordinary manner of living are becoming ever more severe and more numerous. Among other things he reports is that the three gas-works have had to come to a stop; so that there is no more street lighting. The electricity works will have to do the same during the present week; and then the trams will be unable to run. For days there has been not a drop of petroleum to be got in the city. Candles arrive now and again by parcel post from Austria, and then cost three piastres apiece—a price for which a whole packet could formerly be bought. The correspondent reflects: "How we shall warm ourselves in the winter if the present condition of things continues a few months longer, is still an unsolved riddle."

Electricity "Leakages" at Southend.—Commenting on the electricity charges in the borough, the "Southend-on-Sea Observer" says: A certain class of customers of the Corporation Electricity Department will have to pay more for electricity after the 24th inst. The reasons for the change, as put forward by the Chairman of the Committee at the recent Council meeting, are not very convincing in themselves. The Council were told that, though the meters had been gauged at a rate which made the price work out at 5d. per unit, as a mater of fact the net revenue had been 2·94d. per unit. Nothing was said to account for the disparity in the figures. The public ought to be told. Something like 2d. per unit seems to have gone astray somewhere. Presumably these twopences are keeping company with the more than half-a-million units which, according to the official statement for the year ended March, 1914, went astray during the twelve months (three times more than the quantity used for public lighting), or, in official parlance, are "not accounted for." Anyway, consumers of electricity with prepayment meters will have to pay 6d. per unit in future.

"R.H.D." Week.

OCTOBER 4th to 9th, 1915.

WE invite you to our London Showrooms to a SPECIAL DEMONSTRATION of the "R.H.D." (Radiant Heat Distributor) Gas-fire—one of the most important advances yet made in Gasfire construction. Booklet fully describing this new Fire will now have reached you.

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London Offices & Showrooms:—
132, Queen Victoria Street, E.C.

Clay Cross Gas Prices.—The Clay Cross Gas Company have given notice of their intention to raise the price of gas by 3d. per 1000 cubic feet. This means that the price will be 4s. for lighting purposes and 3s. for power, heating, and cooking. The Company supply gas to Clay Cross, Tupton, North Wingfield, Pilsley, Stonebroom, Morton, and several other villages in the locality.

Lighting of Athy.—The Athy Urban District Council have declined to accept the Gas Company's tender for lighting. It appears that, owing to the increased cost of coal, the Company raised the price from 5s. to 5s. 5d. per 1000 cubic feet. Mr. Malone said the people did not object to the increase being made for public purposes; but they strongly objected to the raising of the price for private consumers to 6s. 3d.—a price the Company would not get if they went to Parliament to ask for it. It was stated that the lighting of the public lamps had not yet been commenced.

Reduced Lighting and Payment for Gas.—It has been reported to the Newmarket Urban District Council by the Sub-Committee appointed to interview the Directors of the Gas Company with regard to a reduction of the sum payable for public lighting under the existing contract, that the Directors could not see their way to increase the abatement of £100 offered for the past year. A list of replies received by the Clerk from the local authorities of the various towns in the Eastern Counties showed that very substantial allowances were being made in all the cases quoted. It was agreed that the matter be referred to the Town Committee for consideration.

War-Time Economies at Bury.—In accordance with a circular-letter received from the Local Government Board on the question of economy in municipal expenditure, a report on the subject is being prepared for the Parliamentary Committee at their next meeting. It is estimated that the total economies in the various departments will amount to between £4000 and £5000. The Street Lighting Department have reported that fewer men are engaged than in normal times, and that they are saving in gas and electricity about £30 per week. This is in addition to the saving of £750 per year effected by the adoption of incandescent lighting three years ago.

Launceston (Tasmania) Gas Company.—At the half-yearly meeting of this Company on Aug. 6 the accounts presented showed a satisfactory result of the work for the half year to June 30, notwithstanding the increased cost of coal, and the difficulty of obtaining supplies of the best quality. The number of consumers showed an appreciable increase. An interim dividend was paid in February; and the Directors recommended that a dividend at the rate of 4 per cent. for the half year be declared. The coal carbonized during the six months was 2019 tons, and the gas manufactured 22,656,200 cubic feet. The Chairman (Mr. H. Weedon), in moving the adoption of the report and accounts, hoped that things would soon settle down and that they would be able to return to their normal state. The affairs of the Company had been well looked after by the Manager (Mr. Arthur Green) and his staff.

Southport and the Hire of Gas-Fires.—The Southport Gas Committee have decided for the present to stop letting out gas-fires on hire. This decision has been come to with the object of keeping down capital expenditure as much as possible during the war. The local ironmongers are taking advantage of it to push the sale of gas-fires, both for cash and on the hire-purchase system.

Burnley Water Supply.—The Local Government Board recently refused, owing to the war, an application for further borrowing powers by the Burnley Corporation, to enable them to complete the new reservoir at Hurstwood. Some time ago, the Board sent down an Inspector to examine the works, with the result that they decided to sanction only the raising by the Corporation of £75,000 [which is the balance of £215,000 originally authorized to be borrowed], so as to enable the works to be brought to a stage at which they could be safely left until the war was over. As the £75,000 will be exhausted this winter, the Corporation have decided to promote a Bill next session to secure further borrowing powers.

Fortunate Coal Contracts at Neath.—That the Corporation have been exceedingly fortunate in their coal contracts for gas purposes was the gratifying statement made by Alderman Hopkin Morgan, J.P., at a special meeting of the Neath Town Council. He added that, if the tenders of last June had been then accepted, the Corporation would have been the losers by thousands of pounds. Wisely, they had proceeded from hand-to-mouth, so to speak, until the favourable moment arrived. Then the contracts were made—practically sufficient for the whole of the winter. The Council, he went on, were conversant with the fact that there had been many complaints with reference to the insufficient supply of gas. This was no new thing. Owing to the abnormal growth of the town in recent years, the mains were too small to meet the demands. The Gas Committee, therefore, asked the Council to sanction a loan of £1000 for the laying of new mains, which were absolutely necessary in the circumstances. This the Council agreed to.

The New Offices of the Metropolitan Water Board.—Referring to the Board's new offices under construction in Rosebery Avenue, the "Builder" last week said: It is not often that a change of contractors takes place during the progress of an important building contract, but the Metropolitan Water Board's General Purposes Committee are recommending this step to the Board. It is proposed that Messrs. Rice and Sons should take up the contract, which they are prepared to do subject to a sum not exceeding £4132 being added to the existing contract of £110,004, to meet the cost of certain items in the original bills of quantities which would now be unremunerative on account of the changed conditions prevailing. The contract figure will still be below that of the second lowest tender, which was that of Mr. J. Carmichael for £116,082, and below Messrs. Rice's competitive tender of £117,650. The Board may be congratulated on obtaining the services of one of the best building firms in London, which should ensure the successful completion of the new offices.

Radiant Efficiency

The Davis 1915 Intense-flame Gas-Fire Burner.

In addition to providing (by the co-operative adjustments of its Silent Injector and Pressure Damper) a range of efficient flames of adjustable intensity, the new Davis Intense-flame Burner also shows a marked improvement in Radiant Efficiency.

A smaller Fire is thus made to suffice for any given heating purpose, and a substantially higher percentage of radiant heat is returned from the gas consumed. *This we guarantee.*

The Davis Gas Stove Co., Ltd., *Gas Exhibition Salons:* **60, Oxford St., London, W.**

Belfast Electricity Supply Station.—Alderman Tyrell (Chairman of the Belfast Electricity Committee) announced at the Corporation meeting last Friday that an application had been made to the Board of Trade to hold an inquiry into the circumstances connected with a recent fire in the electric station and an accident to one of the turbo-alternators [see "JOURNAL" Sept. 7, p. 537], matters which had been the subject of much complaint and suspicion. The Board had, however, intimated that jurisdiction was not vested in that Department, but in the Home Office, with whom communication had now been opened.

Metropolitan Water Board Money Bills.—At the last meeting of the Board the Finance Committee reported that in July the Board authorized them to take the necessary steps for the issue of money bills to an amount not exceeding £1,350,000, in replacement of money bills amounting to £1,000,000 due on Sept. 18, and to meet further capital expenditure. Under their Act of this year, the Board were authorized to issue bills to an amount of £2,000,000; and the Treasury sanctioned the issue of £1,300,000. Tenders for this sum were opened at the Bank of England on Monday last week. On the advice of the Bank of England the bills were for a currency of six months. The total amount applied for was £3,755,500—the highest price being £97 12s. Tenders at £97 10s. 10¼d. received 12 per cent., those above this price being allotted in full. The average rate obtained for the issue was £4 17s. 9 7d.—equivalent to a rate of interest of £5 0s. 3·04d. per cent. per annum.

New Filtration Works at Morley.—The Morley Corporation are to be congratulated upon the completion of a long cherished scheme—the establishing of a new system of filtration in connection with their water-works at Withens, Cragg Vale, near Mytholmroyd. Some two years ago, it was decided to transfer the whole of the filtration to Cragg Vale, alongside the reservoir, put down a new plant, and scrap the existing systems. It was decided to accept the contract of the Turn-Over Filter Company, of Belfast; the estimated cost of the whole scheme being put down as £12,000. A fine new stone building has been erected on the hillside at Cragg, just below the reservoir, and here eleven cylinder filters have been put down, each with a filtering capacity of 8000 gallons per hour. The power required for the cleansing of the quartz in the cylinder is obtained from a petrol-driven engine. The water used for washing purposes is afterwards treated in a sedimentation tank, and then passed down the valley for compensation water. This is an important asset in the new scheme. In addition to the quartz, the filtration is carried out by means of allumino-ferric and lime water; the mixing of these chemicals being carried out by finely-balanced and self-acting machinery installed further up the hillside. Apart from the petrol engines, everything is so planned that it works by gravitation. In fact, economy and simplicity of working are features of the new plant. Though it is proposed to keep all eleven filters working, they are disconnected, and may be dealt with individually. This is the first plant of its kind in operation in connection with domestic water-works, and a good deal of interest is being taken in the experiment throughout the country.

The members of the profit-sharing and saving scheme in connection with the Gloucester Gas Company have made a donation to the British Red Cross Society of over £30.

The Coventry City Council are recommended to suspend, during the period of the war, the test for the illuminating power of the gas, and to substitute a test for calorific power. This is consequent upon a reduction in the illuminating power due to the extraction from the gas of toluol and benzol for Government purposes.

The Cleckheaton Gas Committee are preparing their old works at Marsh for restarting, in view of winter needs—the new works being regarded as scarcely able to meet all requirements. On Sunday afternoon, at the old works, a fire broke out in the engine-house, but was taken in hand and eventually overcome by the work's foreman and a number of men from a neighbouring factory.

An inquest was held at Plymouth last Tuesday on the body of Private Chegwin, aged 19, of the Royal Army Medical Corps, who was employed as orderly at one of the military hospitals in the town. The evidence showed that he was found dead from poisoning by gas fumes in a bath supplied with hot water from a geyser, which had been fitted about three months ago. Captain Taylor, who superintended the fixing of the bath, said the geyser was in a compartment divided by a partition from the bath-room, and had a flue for the conveyance of the products of combustion to the outer air. The fumes must have been driven into the bath-room by back-draught along the flue. A verdict of "Accidental death" was returned.

"Main Reflections" is the title of a new booklet [in a coloured wrapper, depicting a Red Cross Nurse enjoying a "St. Nicholas" fire], which is being issued by Messrs. R. & A. Main, Limited, of Edmonton. Four series of heaters—the "D.S.O.," "the St. Nicholas," the "Fire King" and the "Queen" fires, and the "St. Magnus" steam-radiators—are illustrated and described; and these, it is claimed, cover all that is up-to-date and efficient in modern gas-fire construction. The "Fire King" and "Queen" series is a new departure, introduced specially to fill the gap between so-called inset fires and the ordinary type of outstanding gas-fires. They are self-contained in every respect, and may be fitted anywhere in conjunction with a flue outlet; but they are designed to co-ordinate in size with any modern interior grate, so that when fitted against it "they give a sense and appearance of unison, not of discord." They are handsome in appearance, and embrace all the advantages of the "St. Nicholas" and "D.S.O." fires.

APPLICATIONS FOR LETTERS PATENT.

13,487.—GRAFTON, W., "Controllers for gas-fires." Sept. 22.
13,595.—SOUTH METROPOLITAN GAS COMPANY and CHANDLER, D., "Gas-burners." Sept. 24.
13,663.—TILLEY, F. C., "Burners." Sept. 25.

A CENTRAL RADIANT HEAT DISTRIBUTOR

Specially designed for the efficient heating of Hospital Wards, Factories, Workshops, Libraries, &c.

PARKINSON'S "COMPASS" GAS FIRE

The heat is evenly distributed in all directions, while the duplex burner allows either half of the fire to be alight as desired.

Diam. of Fire, 8½-in. - Price £3 0 0
(Equivalent to a 21-in. fire) (Stone Slab and Guard extra).

THE PARKINSON STOVE CO., LTD.,
BIRMINGHAM and LONDON.

GAS COMPANIES IN THE STOCK EXCHANGE.

Business on the Stock Exchange last week was moved by conflicting factors. The favouring agency lay in the satisfactory despatches from several seats of war—the strong advance of the Allies on the Western front, the Russian recovery on the Eastern, and the important defeat of the Turks on the Tigris. These gratifying incidents inspired a tone of cheerfulness which became more and more pronounced from day to day. A conspicuous indication of this feeling was apparent in the gilt-edged market, where the war loan steadily rose, and buyers were many and sellers few. Colonial issues were in good demand, Home Rails brightened up, South Africans were buoyant, the Foreign Market recovered, and Shipping and the Miscellaneous lines which profit by the war had a good time. But the week did not close without a disagreeable check, produced by the Bulgarian intrigue; and the seriousness of the situation was reflected in Capel Court on Saturday. The successful conclusion of negotiations for the American loan excited keen interest, not unmingled with some soreness on the part of British investors at the handsome terms secured by Uncle Sam. They are pretty steep; but it is a great thing to have got the matter through at all. Business in the Gas Market was better. It was more active, and the prices marked for several issues were on the up-grade. A noteworthy incident was furnished by Alliance and Dublin, which (thanks to the greatly improved position and prospects of the undertaking) achieved the unprecedented distinction of changing hands at a price actually higher than the quotation of July 30, 1914, before the war. The Money Market was firmer in response to a good demand.

Bargains done for cash during the week were as follows: On Monday, Bournemouth debenture 80, 80½, Gas Light ordinary 77½, 77¾, 78½. On Tuesday, Commercial 4 per cent. 84, European 12½, Gas Light ordinary 77½, 77¾, 78, 78½, ditto preference 72⅝, 72¾, 72¾, 73, ditto debenture 62½, 63, San Paulo preference 8⅝, 8¾, South Metropolitan 76½, 77½, South Suburban 88½, 89. On Wednesday, Gas Light ordinary 77¾, ditto preference 73, 73½, South Metropolitan 77, 77½. On Thursday, Brentford debenture 75, Gas Light ordinary 77¾, 78½, Imperial Continental 60, 60½, Primitiva 2, ditto preference 3 5/16, 3⅜, South Metropolitan 77½. On Friday, Brentford debenture 75½, Gas Light ordinary 77¾, Imperial Continental 63⅜, 62, South Metropolitan 76¾, 77½, Watford "B" 106. On Saturday, Alliance and Dublin 68⅜, Gas Light ordinary 77¾, 78⅛, ditto maximum 60, 60½, Imperial Continental 63, 63½, South Metropolitan 76¾, 77½.

The Bank rate is 5 per cent.—as fixed on Aug. 8, 1914.

LOWEST AND HIGHEST PRICES OF BARGAINS DONE FOR CASH IN THE WEEK ENDING OCT. 2.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices. July 30, 1914.	Yield on Highest Closing Price.	Lowest and Highest Prices of Bargains.
£			p.c.			£ s. d.	
1,551,868	Stk.	April 8	2½	Alliance & Dublin Ord.	59—64	3 18 2	68⅜
374,000	,,	July 10	4	Do. 4 p.c. Deb.	76—79	5 1 3	..
280,000	5	April 29	7½	Bombay, Ltd.	5⅛—6⅜	5 17 8	..
50,000	10	Feb. 26	16	Bournemouth Gas and Water { 10 p.c. ; B 7 p.c. ; Pref. 6 p.c. Deb.	29—30	5 6 8	..
878,480	10		7		15—15½	4 10 4	..
95,000	10	,,	6		13½—14	4 5 9	..
—	—	—	—		..	—	80—80½
880,000	Stk.	Feb. 26	14	Brentford Consolidated	261—266	5 5 3	..
330,000	,,	,,	11	Do. New	204—209	5 5 3	..
50,000	,,	,,	5	Do. 5 p.c. Pref.	109—111	4 10 1	..
206,250	,,	June 11	4	Do. 4 p.c. Deb.	91—93	4 6 0	75—75⅛
217,380	Stk.	Feb. 26	11	Brighton & Hove Orig.	208—213	5 3 4	..
344,200	,,	,,	8	Do. A Ord. Stk.	154—159	5 0 8	..
530,000	20	Mar. 26	12½	British	44—45	5 11 1	..
120,000	Stk.	June 26	4	Do. 4 p.c. Deb. Stk.	88—90	4 8 11	..
245,771	Stk.	June 26	4	Buenos Ayres 4 p.c. Deb.	85—87	4 12 0	..
100,000	10	—	—	Cape Town & Dis., Ltd.	1½—2½	—	..
100,000	10	—	—	Do. 4½ p.c. Pref.	4—6	—	..
100,000	Stk.	June 26	4½	Do. 4½ p.c. Deb. Stk.	70—75	6 0 0	..
157,150	Stk.	Feb. 26	5	Chester 5 p.c. Ord.	108—110	4 10 11	..
1,513,280	Stk.	Feb. 12	5/9/4	Commercial 4 p.c. Stk.	106—108	5 1 2	84
560,000	,,	,,	5½	Do. 3½ p.c. do.	103—105	5 1 6	..
475,000	,,	June 11	3	Do. 3 p.c. Deb. Stk.	69½—71½	4 3 11	..
800 000	Stk.	,,	4	Continental Union, Ltd.	76—79	5 1 3	..
200 000	,,	,,	7	Do. 7 p.c. Pref.	115—118	5 18 8	..
—	—	—	—	Croydon B and C 7 p.c.	..	—	..
492,270	Stk.	—	6	Derby Con. Stk.	123—125	4 16 0	..
55,000	,,	—	4	Do. Deb. Stk.	102—104	3 16 11	..
1,002,180	10	July 29	10	European, Ltd.	17½—18	5 11 1	12½
16,362,910	Stk.	Feb. 12	4/17/4	Gas Light and Coke { 4 p.c. Ord. ; 3½ p.c. max. ; 4 p.c. Con. Pref. ; 3 p.c. Con. Deb. ; 10 p.c. Bonds	98—102	4 15 6	77½—78½
2,600,000	,,	,,	3½		76—79	4 8 7	60—60½
4,062,235	,,	,,	4		96—99	4 0 10	72⅝—73½
4,674,850	,,	June 11	3		72½—74½	4 0 6	62½—63
130,000	,,	,,	10		..	—	..
258,740	Stk.	Mar. 12	5	Hastings & St. L. 3½ p.c.	87—89	5 12 4	..
70,000	10	April 29	11	Hongkong & China, Ltd.	16½—16¾	6 11 4	..
—	—	—	—	Hornsey 7 p.c.	..	—	..
131,000	Stk.	Mar. 12	7½†	Ilford A and C	151—154	5 2 4	..
65,780	,,	,,	6⅜†	Do. B	115—118	5 8 0	..
65,500	,,	June 26	4	Do. 4 p.c. Deb.	92—94	4 5 1	..
4,940,000	Stk.	May 14	9	Imperial Continental	150—160	5 12 6	60—63½
1,235,000	Stk.	Feb. 12	3½	Do. 3½ p.c. Deb. Red.	84—86	4 1 5	..
200,242	Stk.	Mar. 12	6½	Lea Bridge Ord. 5 p.c.	119—121	5 7 5	..
561,000	Stk.	Feb. 26	10	Liverpool 5 p.c. Ord. { A ; B	211—213	4 13 11	..
718,100	,,	,,	7		146—14	4 14 7	..
306,083	,,	June 26	4	Do. 4 p.c. Pr. Deb. Stk.	..	—	..

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices. July 30, 1914.	Yield on Highest Closing Price.	Lowest and Highest Prices of Bargains.
£			p.c.			£ s. d.	
75,000	5	June 11	6	Malta & Mediterranean	4½—4⅝	6 9 9	..
250,000	100	April 1	4½	Met. of Melbourne { 4½ p.c. Deb.	99—101	4 9 1	..
541,920	20	May 28	4	Monte Video, Ltd.	11½—12	6 18 4	..
1,775,892	Stk.	July 29	4½	Newc'tle&G'tesh'd Con.	98¼—99½	4 10 6	..
529,705	Stk.	June 26	3½	Do. 3½ p.c. Deb.	89—93	4 4 10	..
55,940	10	Feb. 26	7/14/0	North Middlesex 7 p.c.	14—15	5 2 8	..
300,000	Stk.	May 14	8	Oriental, Ltd.	117—122	6 11 2	..
60,000	5	May 26	10	Ottoman, Ltd.	7⅛—7⅜	6 9 0	..
60,000	50	Feb. 26	13	Portsea, Island B	128—131	4 19 3	..
100,000	50		12	Do. C	118—121	4 19 2	..
52,000	50	,,	10	Do. D	..	—	..
249,980	5	April 29	8	Primitiva Ord.	5½—6	6 13 4	2
499,960	5	June 26	5	,, 5 p.c. Pref.	4¾—5	5 0 0	3⅞—3½
521,600	100	June 2	4	,, 4 p.c. Deb.	91—93	4 6 0	..
—	—	—	—	,, ,, 1911	..	—	..
846,198	Stk.	June 26	4	River Plate 4 p.c. Deb.	85—87	4 12 0	..
150,000	10	May 14	6	San Paulo { 6 p.c. Pref. ; 5 p.c. Deb.	10½—11	5 9 1	8⅝—8¾
125,000	50	July 1	5		47—49	5 2 0	..
135,000	Stk.	Mar. 12	10	Sheffield A	223—224	4 9 3	..
209,984	,,	,,	10	Do. B	222—224	4 9 3	..
523,500	,,	,,	10	Do. C	220—222	4 10 1	..
90,000	10	May 28	9	South African	10½—11½	7 16 6	..
6,429,895	Stk.	Feb. 12	5/4/0	South Met., 4 p.c. Ord.	111—113	4 16 8	76½—77½
1,895,445	,,	July 10	3	Do. 3 p.c. Deb.	72½—74½	4 0 6	..
209,820	Stk.	Feb. 26	8½	South Shields Con. Stk.	157—159	5 6 11	..
952,795	Stk.	Feb. 26	6	S'th Suburb'n Ord. 5 p.c.	114—116	5 3 5	82—89
60,000	,,	,,	5	Do. 5 p.c. Pref.	110—112	4 9 3	..
—	—	—	—	Do, West Kent.	..	—	..
137,058	,,	June 26	5	Do. 5 p.c. Deb. Stk.	116—118	4 4 9	..
629,740	Stk.	May 14	5	Southampton Ord.	99—102	4 18 0	..
120,000	Stk.	Feb. 12	7½†	Tottenham District { A 5 p.c. ; B 3½ p.c. ; 4 p.c. Deb.	135—138	5 8 8	..
742,275	,,	,,	6†		115—117	5 2 7	102 -102½
181,255	,,	June 26	4		87—89	4 9 11	..
182,380	10	Dec. 30	5	Tuscan, Ltd.	5—6	8 6 8	..
149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	93—95	5 5 3	..
236,476	Stk.	Mar. 12	5	Tynemouth, 5 p.c. max.	108½—109½	4 11 4	..
				Wandsworth, Wimbledon, and Epsom—			
30,000	Stk.	Feb. 26	8⅜	Wandsworth A 5 p.c.	151—156	5 7 4	..
255,636	,,	,,	6⅝	,, B 3½ p.c.	129—134	5 2 7	..
108,075	,,	,,	5/17/8	,, C 3½ p.c.	110—115	5 2 0	..
852,000	,,	,,	6½	Wimbledon 5 p.c.	117—122	5 0 5	104½—105
98,000	,,	,,	6⅜	Epsom 5 p.c.	121—126	5 5 2	..
88,416	,,	June 26	3	3 p.c. Deb. Stk.	66—69	4 6 11	..

* Ex Div.

WANTED, FOR SALE, CONTRACTS, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Appointments, &c., Vacant.

SUPERINTENDENT. Sheffield Gaslight Company. Applications by Oct. 13.

ASSISTANT-ENGINEER. Sheffield Water Department. Applications by Oct. 22.

WORKING FOREMAN. Abertillery Gas Department.

Appointments Wanted.

REPRESENTATIVE. No. 6102.

RESPONSIBLE POSITION IN GAS UNDERTAKING OR GAS MANUFACTURING FIRM. No. 6103.

Meeting.

DANISH GAS COMPANY. Millbank House, Westminster. Oct. 28. 2.30 o'clock.

TENDERS FOR

Coal.

LIMERICK GAS DEPARTMENT. Tenders by Oct. 11.

Fire Clay Goods.

SALFORD GAS DEPARTMENT.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

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Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.

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